HISTORY OF CHEMICAL, PHYSICAL AND BIOLOGICAL METHODS, SAMPLE LOCATIONS AND LAKE MORPHOMETRY FOR THE DORSET ENVIRONMENTAL SCIENCE CENTRE (1973 - 2006)

Report prepared by:

R.E. Girard
B.J. Clark[1], N.D. Yan[1, 2]
R.A. Reid[1], S.M. David[3], R.G. Ingram[1]
and J.G. Findeis[1, 4]

[1] Ontario Ministry of the Environment
Dorset Environmental Science Centre
P. O. Box 39
Dorset, Ontario
P0A 1E0

[2] York University, Department of Biology
4700 Keele Street
Toronto, Ontario
M3J 1P3

[3] SMD Technical Services
P.O.Box 331
Dorset, Ontario
P0A 1E0

[4] Trent University
Environmental and Resource Studies
1600 West Bank Drive
Peterborough, Ontario
K9J 7B8

DATA REPORT 2007/

PREFACE

This report is published to provide a readily available source of basic environmental, limnological and water quality information collected on lakes and watersheds from many regions of Ontario by staff of the Dorset Environmental Science Centre. These data were collected as part of aquatic research and monitoring programs that were developed to support major Provincial and Federal pollution abatement initiatives beginning in 1973 when the Ontario Ministry of the Environment (MOE) was created from the former Ontario Water Resources Commission (OWRC).

One of the most intensive aquatic research studies in North America began with the limnological portion of the Sudbury Environmental Study (1973-1980). This study was initiated to investigate the effects of acidification on aquatic habitats in the greater Sudbury area and to characterize the distance and direction of long range transport of the smelter emissions. The core set of four study lakes have been monitored throughout the ice-free seasons of 1973-2006 and provides temporal data for chemical, physical and biological variables. The limnological portion of the Lakeshore Capacity Study (1975-1981) was initiated to investigate the relationships between lakeshore development and lake trophic status in low ionic strength Precambrian Shield lakes. The Acid Precipitation in Ontario Study (1979-1989) was initiated, in part, to investigate the effects of the deposition of strong acids on aquatic and terrestrial ecosystems in Ontario. The Dorset Environmental Science Centre, presently part of the MOE's Environmental Monitoring and Reporting Branch, continues to investigate the aforementioned lakes for the effects of anthropogenic stressors on aquatic ecosystems in Ontario. The primary findings of these studies have been, and will continue to be, published as peer-reviewed papers in international scientific journals, technical reports, and conference proceedings.

ABSTRACT

This data report summarizes the water chemical, physical and biological sampling methods routinely used from 1973-2006 by field personnel of the Ontario Ministry of the Environment at the Dorset Environmental Science Centre (DESC). The purpose of this report is to consolidate and summarize the methods previously reported in DESC studies with special attention to chronicling methodological changes over time.

All of the morphometric data developed throughout the studies by the DESC over the period 1973-2006 are provided and include revisions to the previously reported sub-basin morphometry for lakes Muskoka, Joseph and Rosseau. All water sampling procedures, protocols and apportioned sample volumes utilized in the volume-weighted composite technique are presented herein. Similarly, all biological sample collection methods (phytoplankton, zooplankton, macroinvertebrates, and crayfish) and taxonomic references used by staff of the DESC for the identification of zooplankton and macroinvertebrate species during the period 1973 –2006 are also summarized.

R. E. Girard, B.J. Clark, N.D. Yan, R.A. Reid, S.M. David, R.G. Ingram and J.G. Findeis. 2007
History of chemical, physical and biological methods, sample locations and lake morphometry for the Dorset Environmental Science Centre (1973 - 2006) Ont. Min. Envir. Technical Report 2007/.

TABLE OF CONTENTS

PREFACE i
ABSTRACT ii
TABLE OF CONTENTS iii
LIST OF TABLES v
LIST OF FIGURES vi
LIST OF APPENDICES vi
1. Introduction 1
2. Methods 3
2.1 Historical context 3
3. Chemical parameter test groups for routine sampling programmes 16
3.1 Chemical sampling methods 20
3.2 Ministry of the Environment – Laboratory remarks codes 23
4. Thermal Stratification 29
4.1 Sampling protocol for chemistry with depth enforced layers 29
4.2 Depth enforced limnetic layers 29
4.3 Thermal energy content of the routine study lakes 31
5. Lake Morphometry 34
5.1 Morpometric parameters 34
5.2 Hydrological data calculations for the study lake water balance analysis 38
5.3 Areal units and associated calculations 38
6. Lake Station location, abbreviation and identification codes 41
7. Biological Sampling Methods 69
7.1 Light, phytoplankton, chlorophyll 69
7.2 Zooplankton (1976-2006) 70
-Special Sampling for *Bythotrephes longimanus* (Leydig, 1860) 72
-Sample preservation 74
-Sample enumeration 74
-Zooplankton identification and enumeration: a working example 75

7.3 Benthic Invertebrate Communities (1988-2006) 83
- Lake and site selection (Littoral zone benthos) 85
- Laboratory processing 88
- Crayfish (1988-2006) 90
- Fish presence / absence 96
8. Acknowledgements 113
REFERENCES 114
General taxonomic references for macroinvertebrates 124
Specialized macroinvertebrate references 125
General taxonomic references for zooplankton 128
Specialized zooplankton references 129
Crustacean zooplankton length - weight relationship references: 134

LIST OF TABLES

Table 1. Ice-off and ice-on Dates for Dorset (DESC) Lakes (Day equals the Julian calendar day) 9

Table 2a. Summary of study lakes: sampling period, protocol and frequency (1973-2006) 10

Table 2a. Multiple basin sample locations established in 1986-1989 showing field ID 12

Table 2b. Rice and Sturgeon lakes Nutrient Budget Study 1986-1989 Flow weighted sampling regime used by local observers at tributary water quality monitoring stations 14

Table 2c. Multiple basin sample locations, 1986-1989 showing field ID and station codes for Rice and Sturgeon lakes [from Hutchinson et al. (1994b, 1994c, 1994d)] 15

Table 3a. Lab Informaion System (LIS) Chemical parameter test groups for routine sampling programmes (1986-1994) 17

Table 3b. Laboratory Information Management System (LIMS) Chemical parameter test groups for routine sampling programmes (1995-2006) 17

Table 3c. Dorset (DESC) Parameter codes and LIMS product names (1995-2006) 18

Table 3d. Ministry of the Environment (Laboratory Services Branch, Toronto) test parameter codes and LIMS product names (1995-2006) 19

Table 3e. LIMS chemical parameters and required sample submission bottle types 21

Table 4a. Study lakes: chemical test groups (LIS 1986-1994) 22

Table 4b. Study lakes: chemical test groups (LIMS 1995-2006) 23

Table 4c. Summary of long-term changes in the protocols employed to analyze water samples from the lakes: Analytical Method Codes (1973-2006) 24

Table 5. Trend through time lake stratification and sample protocol numbers (1990-1998) 32

Table 6. Depth enforced limnetic layers (1990-1998) 33

Table 7a. Location of the DESC study lakes including Station ID codes 43

Table 7b. Physical characteristics of the DESC study lakes including acid sensitivity (MOE, 1989) 54

Table 8. Revised summary of morphometric data for the multiple basin study lakes 65

Table 9. Muliple basin lake sample stations established in 1986: station abbreviation, location, relevant topographic map sheets, and quarternary watershed designation. 67

Table 10. Number of crustacean zooplankton samples collected each year (1976-2006) 78

Table 11. Lengths of vertical hauls combined to form composite zooplankton samples in the study lakes after May 1978. Number of hauls per sample varies from 1 to 7 80

Table 12. Summary of parameters (a and b in $W=aL^b$) of length-weight regression equations used to estimate individual zooplankton dry weight (W in µg) from body length (L in mm). 82

Table 13. Stream benthos - temporal series. (1988 - 2006) 83

Table 14. Lake benthos - temporal series (1988 - 2006) 84

Table 15 Lake benthos – spatial reference series (1988 - 2006).....86

Table 16 Taxonomic and common names of benthic macroinvertebrates.....89

Table 17. Lake crayfish - temporal series (1988 - 2006). 91

Table 18 Lake crayfish - repeated spatial series 1989 - 1994 and 2005 - 2007.....92

Table 19 Fish species names and OMNR code numbers.....97

Table 20 Lake fish occurrence by secondary watershed division.....98

LIST OF FIGURES

Figure 1. Master Zone Map for the Stratified Random Sampling Design of Harp Lake.....73

LIST OF APPENDICES

Appendix 1. Lake morphometry, including area, volume, mean depth, maximum depth shoreline length, development of shoreline, development of volume, contour depth, contour area, stratum volume. Bathymetric maps show chemistry sampling location and sites for crayfish and kick and sweep sampling ..... App. 1-1

Appendix 2 Sample submission to MOE and Trent labs at the Dorset Environmental Science Centre ..... App. 2-1

Appendix 3. Lake specific sample volume proportions for the volume - weighted composite sample technique (1973 - 2006) ..... App. 3-1

Appendix 4 Summary of MOE DESC zooplankton ID codes and species names and nomenclature changes (1980 - 2006)..... App. 4-1

Appendix 5. Summary of biological projects using benthos (1987 - 2006)..... App.5-1

Appendix 6. List of OMNR fish ID codes and names of fish species (March 1986)* ..... App. 6-1

Appendix 7. Conversion factors for physical, chemical and calendar parameters..... .App. 7-1

1. INTRODUCTION

This report describes the chemical, physical and biological sample collection methods used in the investigations of lakes and watersheds by staff of the Dorset Environmental Science Centre (DESC, formerly the Dorset Research Centre) for the period 1973 to 2006. Also included are important references and methodology for key biological variables analyzed in these studies. The purpose of this report is to consolidate and summarize the methods previously reported in DESC studies with special attention to chronicling methodological changes over time. Previous methodology reports include Scheider et al. (1983), Locke and Scott (1986), Girard and Reid (1990a), Clark (1996), and Ingram et al. (2006). All of the morphometric data developed at the DESC (1973-2006) are provided and include revisions to the sub-basin morphometry for lakes Muskoka, Joseph and Rosseau, previously reported in Girard and Reid (1990).

Studies conducted at the DESC have resulted in long-term records of chemical, physical and biological parameters in lakes and associated watersheds. Current models such as the Trophic Status Model (Lakeshore Capacity Study), in addition to dissolved oxygen and chlorophyll models (Clark and Hutchinson 1992) have been developed for the purpose of determining the trophic status of inland lakes. Assessment of the chemical water quality of Lake Nipissing has occurred in several successive surveys. Early intensive chemical sampling of Lake Nipissing was conducted by the Ministry of the Environment in 1971, 1974, 1975, 1988 and 1990. The latter program was designed to update the status of major inland lakes in Ontario (Neary and Clark 1992). Recent sampling of Lake Nipissing (Clark et al. 2007) was a collaborative effort with the Lake Nipissing Stewardship Council, Nipissing Friends of the Environment and volunteers.

Monitoring within the Lake Simcoe watershed has been an ongoing collaborative effort between the Lake Simcoe Region Conservation Authority, Water Survey of Canada and the Ministries of Agriculture and Food, Environment and Natural Resources from 1971 to 2006 (Scott et al. 2001, 2006). The data have been gathered in accordance with protocols related to water level and stream flow (Water Survey of Canada 1990 - 2004), and water quality sampling and analysis (Ministry of Environment).

A long term biomonitoring program was initiated in 1988 to assess long-term trends in the benthic macroinvertebrate communities in acid-sensitive, softwater Precambrian Shield lakes. This latter work represents the central Ontario component of the federal-provincial Long Range Transport of Airborne Pollutants (LRTAP) program that was designed to assess regional changes in the health of inland aquatic ecosystems associated with reductions in sulphur emissions (Shaw et al. 1992). Following this work, protocols were developed for the rapid bioassessment of lakes and streams (David et al. 1998) in order to provide an inexpensive, relatively simple benthos screening tool.

Monitoring of nonindigenous species (NIS) has involoved a number of partnerships. These include the spiny water flea (1982), zebra mussel (1986) and fishhook waterfleas (1998). Invasions throughout the Great Lakes and into surrounding inland lakes have resulted in several collaborative monitoring efforts with DESC staff, including Federal (Canada, United States), Provincial (Ontario, Quebec) and District (The District Municipality of Muskoka, Sudbury) governments. Other collaborations have included several universities in Ontario, Minnesota and Wisconsin, as well as Conservation Authorities (Lake Simcoe Regional Conservation Authority, Saugeen Valley Conservation Authority), the Ontario Federation of Anglers and Hunters, the Federation of Ontario Cottager Associations, and the Lake of the Woods District Property Owners Association. A portion of the Ontario component of this collaborative effort was hosted at the Dorset Environmental Science Centre (2005 - 2006) as part of the Canadian Aquatic Invasive Species Network (CAISN). Monitoring of the spiny water flea (*Bythotrephes longimanus*) has been ongoing with the Ministry of Natural Resources and DESC since the first detection in the Muskoka lakes in the late 1980s. The spiny water flea first invaded Harp Lake, one of the DESC's more intensively monitored lakes, in 1992, and has remained an integral part of a modified Harp Lake ecosystem ever since (Yan et al.1997).

Algal bloom studies have focused on a number of Ontario lakes as a result of MOE regional requests. The studies included Lake of The Woods (Pla-Rabes et al. 2007), Brandy Lake (Paterson and Ingram 2003), McGown Lake (Clark et al. 2005) and the Three Mile Lake on going study.

2. METHODS

2.1 Historical Context

Four Sudbury-area lakes (Clearwater, Hannah, Lohi, and Middle) were monitored monthly during 1973-1989 under the Sudbury Environment Study and included bi-monthly sampling under ice during the winters of 1980-1983 (Table 2a). Sampling continued through the ice-free period with six times in each of 1990 and 1991, twice in 1992, five times in each of 1993 to 1998, and six times in each of 2000 to 2006. The Sudbury lakes chemical data (1973 – 1979) were summarized in Yan and Dillon (1982). The long-term records of chemical, physical and biological parameters have continued (1999 - 2006) under a collaborative arrangement including staff of the Ministries of Environment and Natural Resources and Laurentian University. A more recent summary of the physical and chemical data series (1973 - 2001) for these lakes is presented in Girard et al. (2006).

The Lakeshore Capacity Study was initiated to model current and future proposals for shoreline development of Ontario's inland lakes. The principal focus of these models was the quantification of phosphorus inputs to lakes from all measured sources allowing the human-derived portion of the total (seepage from waste disposal systems) to be assessed for its contribution to lake trophic status. A set of hydrologically calibrated watershed lakes ("A" lakes in Table 2a) was monitored weekly during the ice-free period (Table 1) from 1976 to 1982 (Scheider et al. 1983b), and bi-weekly from 1982 to 1985 (Hutchinson et al. 1993a). Of the "A" lakes, Crosson, Harp, Heney, and Plastic Lake were monitored bi-weekly from 1986 to 1990. Monitoring of lakes Blue Chalk, Chub, Dickie, Red Chalk East and Red Chalk Main was reduced to monthly from 1986 to 2006 while Crosson, Harp, Heney, and Plastic were sampled monthly from 1991 to 1997. Crosson and Heney lakes were sampled monthly in 1998 to 2006, while lakes Dickie, Harp and Plastic were sampled bi-weekly throughout this period. Ridout Lake was added to the monthly series of lakes in 2003 and 2006. All "A" lakes were sampled monthly during the ice cover period from 1986 to 1993. Lakes Mouse (Moose) and Ranger were sampled monthly during the ice-free period from 1991 to 1997. The Brandy Lake Algal Bloom

Study was added to the bi-weekly schedule from 2002 to 2003. The Three Mile Lake Algal Bloom Study was added to the bi-weekly schedule for 2006.

A second set of lakes associated with the Lakeshore Capacity Study ("B" lakes in Table 2a) was selected for the purpose of testing models developed from information collected from the “A” lakes and their watersheds. Several of these models involved geology and geochemistry of the lake catchments. Because of this, a set of nine additional watersheds (“Export”in Table 2a) was studied to extend the range in geological characteristics beyond that observed for the “A” and “B” lakes (Dillon et al. 1986). The “B” lakes were sampled monthly during the ice-free period (1976 - 1989), three times during the ice-free period of 1990 and 1991, twice in 1992 and once each spring 1993 to 1995. The “B” lake water sampling was resumed in 1998 with spring and fall samples.

Additional lakes were added in 1979 to extend the range of geological characteristics and geochemistry to further develop the Lakeshore Capacity Model. These lakes were termed the "C" lakes (Table 2a). The “C” lakes were sampled monthly during the ice-free period 1979 to 1989, three times during 1990 and 1991, twice in each of 1992 and 1998. From 1999 to 2006 a combination of eight “B” and eleven “C” lakes were sampled once in the spring and fall. The “B” and “C” lake sampling method from 1976 to 1998 was the volume-weighted composite technique from surface to one metre above bottom; however from 1999 to 2006 a single spring collection used a zero to five metre composite bottle technique.

The “B” lakes chemical summary data are presented in Girard and Reid (1985, 1991n). The “C” lakes chemical summary data reports are presented in Reid and Girard (1987) and Girard and Reid (1991o).

From 1981 to 1985, twelve “Algonquin-Haliburton” lakes (Table 2) were sampled as part of a joint MOE/MNR project (Reid et al.1984; Reid and Girard 1987). These lakes were sampled monthly during the ice-free season. All of the aforementioned study lakes were incorporated into the Acid Precipitation Study (1979 - 1989), to investigate the effects of the deposition of strong acids on aquatic ecosystems in Ontario. In 1986 an additional group of 14 sensitive lakes were included (Table 2a). Monthly samples were collected year-round throughout the Districts of Parry Sound and Nipissing and Haliburton County (Girard and Reid

1990). Monthly sampling of Clear, Delano and Westward lakes continued (1981-1992) and Pearceley, Little Whetstone, and Windfall lakes were added to the set from 1988 to 1992. Hamer and Young lakes were added to the set in 1990 to 1992.

The Dorset Environmental Science Centre core set of lakes continued to be sampled from 1999 to 2006. Three "A" lakes (Dickie, Harp & Plastic) were sampled bi-weekly, while the remaining 6 lakes were sampled monthly. A combined group of twenty-five lakes ("B", "C" and "four Sensitive lakes") were sampled once in the spring of each year (2000-2006) with Ridout Lake added in the latter two years. Dissolved oxygen and temperature profiles were determined for this new group of lakes in the autumn of 2002-2006 (but with no additional chemical sampling at those times). Table 2a describes the availability and frequency of chemical samples for all study lakes (1973 - 2006).

In 2004, a collaborative two year study between York University and the Dorset Environmental Science Centre was initiated to update the chemical and biological data for 45 reference lakes previously reported in Yan et al. (1996). The historical (1983 - 1988) and new data (2004 - 2005) were collected using the same methods, biologically analysed by the same protocols, and summarized under the same supervisory personnel. The reference study lakes are designated in Table 2a as (RS: year) within each of the historical lakes classifications.

In 1988 the Inland Lakes Programme was initiated which was to assess the importance of major anthropogenic stresses on inland lakes, including eutrophication, acidification and contamination of the food chain. These studies include the Muskoka Lakes Project in cooperation with the Ontario Ministry of Natural Resources and the Lake Nipissing Project in cooperation with the North Bay District Office of the Ministry of Environment. The Muskoka Lakes Project (Reid and Girard 1988) includes Lake Muskoka, Lake Joseph, Lake Rosseau, and Lake of Bays (Table 2a) with a bi-weekly sample programme on Gravenhurst and Muskoka Bays 1986 - 1988 and monthly sampling throughout 1989. Cliff Bay (Lake Muskoka) was sampled from 1987 to 1989. In addition, MOE staff sampled Gravenhurst and Muskoka bays and South Bay in Lake Muskoka from 1990 to 1992. The MNR Muskoka Lakes Fisheries Assessment Unit (MLFAU), continued collecting temperature, dissolved oxygen, Secchi disc visibility and zooplankton samples at many of the original 37 stations in 1990, 1991 and 1992. In the spring of

1993 all 37 stations were sampled to characterize lake-wide water chemistry. Each of the 37 stations was visited again in September 1993 to collect oxygen profiles. A subset (19) of these stations was monitored monthly (May to Nov.) to observe seasonal variation in water quality (Table 2a). In 1993, the sampling frequency was increased to twice monthly at four of the Lake Muskoka stations (IM1, IM2, IM5 and IM13) to observe trophic status indicators (TSI). These stations were revisited once between each regular monthly sampling visit and sampled for total phosphorus, chlorophyll and turbidity. Temperature, oxygen and water transparency data were collected at each visit.

The Muskoka Lakes Fisheries Assessment Unit discontinued the volume-weighted sampling after the 1993 field season in favour of composite sampling methods. Other biological collection techniques, such as those used for the collection of zooplankton samples, were unchanged (Clark 1996). In 1994, 36 of the original 37 stations were visited twice per month to observe trophic status parameters, to investigate the losses in water clarity observed between 1986 and 1993. In 1995 a further subset of stations was visited (Table 2a). These were the stations where long-term monthly data had been previously collected. Twice monthly sampling at the TSI sites was again continued for the third year.

Assessments of the chemical water quality of Lake Nipissing has occurred in several surveys. Early intensive chemical sampling was conducted by the Ministry of the Environment (in 1971, 1974, 1975, 1988 and 1990). Sampling was designed to update the status of major inland lakes, and to use this information to amend a database of water chemistry on inland lakes in Ontario (Neary and Clark 1992). All samples were water column composites from 0 - 5m or to within 1m of the bottom in the case of shallow stations (Table 3a). Recent sampling of Lake Nipissing (2003 - 2005) was a collaborative effort with the Lake Nipissing Stewardship Council, Nipissing Friends of the Environment and volunteers. Twenty-one of the original twenty-six stations were sampled as well as four additional sites in the West Arm. The chemical water quality of Lake Nipissing (2003 - 2005) was presented in Clark et al. (2006).

The Rice and Sturgeon Lakes Nutrient Budget Study was initiated (1986-1989) to investigate linkages between point and non-point sources of nutrients, water quality, and aquatic life within the lakes and to estimate the impacts of these processes on in-lake water quality. This

study was supervised by the Rice - Sturgeon Lakes Nutrient Budget Technical Committee which had representatives from the Limnology Section, Water Resources Branch (DESC) and the Central Region of MOE, the Trent Severn Waterway (Environment Canada) and the Kawartha Lakes Fisheries Assessment Unit of the Ontario Ministry of Natural Resources. Long-term changes in the trophic status of Rice and Sturgeon lakes were determined from results of surveys carried out in 1971 and 1972 by staff of the Ontario Water Resources Commission and by the later MOE studies undertaken in the 1980s. In both lakes, euphotic zone composite samples collected at 3 week intervals were analyzed for total phosphorus (TP), chlorophyll a and Secchi depth and other chemical parameters presented in Table 3a. Under ice samples were taken in February of 1987 and 1989 at the deep station on each lake. Sample frequency was intensified on Rice Lake during the peak in growth and senescence of *Potamogeton crispus* in June and mid-July 1986 – 88. The results of the more recent Rice and Sturgeon lakes study are presented in twelve technical reports (Hutchinson et al. 1994b, Hutchinson et al. 1994c, Hutchinson et al. 1994d, Ryback et al.1994, Nicholls et al. 1994, 1996, Limnos Ltd 1994a, 1994b, Beak Consultants Ltd. 1994, Limnos Ltd. et al. 1994, Badgery et al. 1994, Standke 1994), with an overview of the nutrient budget presented in Hutchinson et al. (1994e). Finally, Rice Lake water quality was sampled within limnocorrals set up in 1986 and 1987. These measurements are summarized in a separate report (Michalski et al. 1991). Summaries of sampling protocols are given in Tables 2b, and 2c.

In 1987, a biomonitoring programme was initiated to assess long-term trends in the composition of benthic invertebrate communities in acid-sensitive, softwater Precambrian Shield lakes. This work represents the central Ontario component of the federal-provincial Long Range Transport of Airborne Pollutants (LRTAP) programme that was designed to assess regional changes in the health of inland aquatic ecosystems associated with reductions in sulphur emissions (Shaw et al. 1992). A set of 12 low to moderate alkalinity lakes was sampled in the fall of 1988 to 1992 (Reid et al. 1997b). An additional set of 8 low alkalinity lakes was sampled in 1988 to assess the relationships between lakes with negative alkalinity relative to lakes with positive alkalinity (Girard et al. 1997a). In addition a series of 51 lakes, including the aforementioned, and 8 ponds, were sampled (1993 - 1996) to evaluate benthic invertebrate

communities in acid-sensitive, softwater Precambrian Shield lakes and hardwater lakes in southern Ontario (Girard et al. 2002). This, in part, complemented a subcomponent of the (LRTAP) biomonitoring programme, in which wetlands were sampled by the Canadian Wildlife Service to assess the impacts of acidic deposition on wildlife (McNicol et.al. 1996). A temporal analysis of a core set of lakes was performed using biological and substrate parameters 1993 - 1999 (Girard et al. 2002). Sampling protocols for the use of benthic macroinvertebrates in assessment of stream water quality were documented by David et al. (1997a).

A subcomponent of the (LRTAP) biomonitoring programme was designed to monitor crayfish relative abundance over time. Crayfish catches in baited traps from 20 study lakes over a period 1988 to 2006 were collected to assess: (1) the occurrence, catch per unit effort and the proportion of males to females in the total catches, (2) the size distribution of the catch, and (3) relationships with water chemistry data for each lake (David et al.1994). A broader 100 lake survey throughout seven tertiary watersheds was performed from 1989 through 1994 to assess geographic distribution and relative abundance of crayfish in south-central Ontario (David et al. 1997b). A 19-year summary report for eighteen of the study lakes is presently under review (Somers et al. 2007) to update the findings reported in David et al. (1994).

Table 1. Ice-Off and Ice-on Dates for Dorset (DESC) Lakes[1] (# Day equals the Julian calendar day).

	Year	Ice-Off	First # Day[1]	Ice-On	Last # Day	Ice-Free Days	Ice-On Days	
1	1975	30 APR	120	30 NOV	334	214		
2	1976	18 APR	109	10 NOV	315	206	140	Leap Year
3	1977	15 APR	106	24 NOV	328	222	157	
4	1978	06 MAY	126	21 NOV	325	**199**	**163**	
5	1979	22 APR	112	13 DEC	347	235	152	
6	1980	21 APR	113	20 NOV	326	213	131	Leap Year
7	1981	04 APR	94	30 NOV	334	240	134	
8	1982	29 APR	119	10 DEC	344	225	150	
9	1983	20 APR	111	04 DEC	339	228	132	
10	1984	17 APR	108	05 DEC	340	232	134	Leap Year
11	1985	25 APR	115	03 DEC	337	222	141	
12	1986	13 APR	104	01 DEC	335	231	132	
13	1987	13 APR	103	07 DEC	341	238	133	
14	1988	16 APR	107	05 DEC	340	233	131	Leap Year
15	1989	01 MAY	122	27 NOV	332	210	148	
16	1990	26 APR	116	08 DEC	342	226	149	
17	1991	20 APR	110	03 DEC	337	227	133	
18	1992	01 MAY	123	08 DEC	344	221	151	Leap Year
19	1993	21 APR	111	25 NOV	329	218	133	
20	1994	23 APR	113	12 DEC	346	233	149	
21	1995	14 APR	105	29 NOV	334	229	124	
22	1996	01 MAY	122	21 DEC	356	234	153	Leap Year
23	1997	29 APR	119	02 DEC	336	217	129	
24	1998	15 APR	106	18 DEC	353	247	135	
25	1999	14 APR	104	01 DEC	335	231	116	
26	2000	05 APR	96	08 DEC	343	247	126	Leap Year
27	2001	22 APR	113	22 DEC	357	244	136	
28	2002	18 APR	108	04 DEC	338	230	116	
29	2003	23 APR	113	12 DEC	346	233	140	
30	2004	19 APR	110	08 DEC	344	234	129	Leap Year
31	2005	24 Apr	114	06 DEC	340	226	136	
32	2006	15 Apr	105	28 DEC	362	**257**	130	
33	2007	19 Apr	109				**112**	
	Mean		*111.0*		*339.0*	*228.0*	*136.7*	
	Date		*21 APR.*		*04 DEC.*			
	Shortest ice-on winter 2006-2007					Shortest ice-free summer 1978		
	Longest ice-on winter 1977-1978					Longest ice-free summer 2006		

[1]Based on the DESC "A" lakes: Blue Chalk, Chub, Crosson, Dickie, Harp, Heney, Plastic, Red Chalk Main and Red Chalk East.

Table 2a Summary of study lakes: sample period, protocol and frequency (1973- -2006)

Study period and frequency. **a** weekly(1976-82) bi-weekly (1983-2006), **b** monthly,
c 6 times/year, **d** 5 times/year, **e** 3 times/year, **f** twice/year, **g** once/year, ***** whole lake only, **h** MLFAU, **RS** monthly
Lake name superscript numbers identify the unique body of water number in Table 7a

Lake	Study Period	Ice-free Season Sampling Frequency
		A Lakes
Blue Chalk	1976-2006	(a:1976-85) (b:1986 - 2006) (RS:2005 duplicated by Reference Study)
Chub	1976-2006	(a:1976-85) (b:1986 - 2006) (RS:2005)
Crosson	1979-2006	(a:1979-90) (b:1991 - 2006) (RS:2005)
Dickie	1976-2006	(a:1976-85) (b:1986 - 1997)(a:1998 - 2006) (RS:2005)
Harp	1976-2006	(a:1976-90) (b:1991 - 1997)(a:1998 - 2006)
Heney	1976-2006	(a:1979-90) (b:1991 - 2006)
Jerry	1976-80,95	(a:1976-80) (g:1995)
Mouse Stn #3	1991-1997	(b:1991-97) (f: 2003-2004
Plastic	1976-2006	(a:1979-90) (b:1991-1997) (a:1998 - 2006)
Ridout	2000-2006	(b:2000 - 2003) (b:2005 - 2006)
Ranger Stn #4	1991-1997	(b:1991-97) (f: 2003-2004)
Red Chalk Main	1976-2006	(a:1976-85) (b:1986 - 2006)
Red Chalk East	1977-Spring overturn 1980 (a:1977-1980), Spring Overturn 1983-2005 (a:1983-85) (b:1986 - 2006)	
		B Lakes
Basshaunt	1976-95,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-95) (f:98) (g:99-2006) (RS:2004)
Bigwind	1976-96,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-96) (f:98) (g:99-2006) (RS:2004)
Buck	1976-95,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-95) (f:98) (g:99-2006) (RS:2004)
Crosson	1976-1979	(b:1976-1979) see Crosson in the "A" group above.
Glen	1976,78-95,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-95) (f:98) (g:99-2006) (RS:2004)
Gullfeather	1976-95,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-95) (f:98) (g:99-2006) (RS:2005)
Little Clear	1976-95,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-95) (f:98) (g:99-2006) (RS:2004)
Solitaire	1976-95,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-95) (f:98) (g:99-2006) (RS:2004)
Walker	1976-95,98-2006	(b:76-88) (d:89) (e:90-91) (f:92) (g:93-95) (f:98) (g:99-2006) (RS:2004)
McGown	2004	(b: 2004)
		C Lakes
Axe	1979-82,98, 2005	(c:1979-82)(f:1998) (RS:2005)
Brandy	1979-92,98-2004	(c:1979-89) (e:90-91) (f:92 & 98) (g:99-2001) (a:2002-03) (c:2004) (RS:2004)
Brandy West	2002-2003	(a:2002-03)
Cinder	1979-92,99-2003,06	(c:79-89) (e:90-91) (f:92) (g:99-2006) (RS:2005)
Cinder East	1983-92,99-2003, 06	(c:83-89) (e:90-91) (f:92) (g:99-2006) (RS:2005)
Devine	2004-2005	(RS:2004) (g:2005)
Fawn	1976-92,98-2006	(c:76-89) (e:90-91) (f:92 and 98) (g:99-2006) (RS:2004)
Healey	1979-92,98-2006	(c:79-89) (e:90-91) (f:92 and 1998) (g:99-2006) (RS:2004)
Leech	1979-92,98-2006	(c:79-89) (e:90-91) (f:92 and 98) (g:99-2006) (RS:2004)
Leonard	1979-92,98-2006	(c:79-89) (e:90-91) (f:92 and 98) (g:99-2006) (RS:2004)
McKay	1979-92,98-2006	(c:79-89)(e:90-91) (f:92 and 98) (g:99-2006) (RS:2004)
Moot	1979-92,98-2006	(c:79-89) (e:90-91) (f:92 and 98) (g:99-2006) (RS:2004)
Poker	1979-92,98-2006	(c:79-89) (e:90-91) (f:92 and 98) (g:99-2006)
Poker East	1979-92,98-2006	(c:79-89) (e:90-91) (f:92 and 98) (g:99-2006)
Red Pine	1980-82, 2005	(c:1980-82) (RS:2005)
Saw	2004	(RS:2004)

Cont'd

Table 2a cont'd.

Study period and frequency. **a** weekly(1976-82) bi-weekly (1983-2006), **b** monthly,
c 6 times/year, **d** 5 times/year, **e** 3 times/year, **f** twice/year, **g** once/year, ***** whole lake only, **h** MLFAU**, RS** monthly
Lake name superscript numbers identify the unique body of water number in Table 7a

Lakes	Study Period	Ice-free Season Sampling Frequency
		Sudbury Lakes
Clearwater[1]	1973-2006	(b:1973-1989) (c:1990-1991) (f:1992) (d:1993-1997) (b:1998-2006)
Hannah[1]	1973-2006	(b:1973-1989) (c:1990-1991) (f:1992) (d:1993-1997) (b:1998-2006)
Lohi[1]	1973-2006	(b:1973-1989) (c:1990-1991) (f:1992) (d:1993-1997) (b:1998-2006)
Middle[1]	1973-2005	(b:1973-1989) (c:1990-1991) (f:1992) (d:1993-1997) (b:1998-2006)
[1.]Clearwater, Hannah, Middle and Lohi 1998 - 2004 sampled by Laurentian University/ Co-op		
		Algonquin Haliburton
Big Porcupine	1983-1985, 2005	(b:1983-85) (RS:2005)
Bonnechere	1983-1985, 2005	(b:1983-85) (RS:2005)
Clear	1979-96,98-2005	(c:1979-82) (b:1983-91) (e1992-93) (f1994-95) (g:1996) (f:1998)
Clear cont'd		(g:1999-2006) (RS:2005)
Crown	1983-85, 95-96,98, 04	(b:1983-85) (f:1995) (g:1996) (f:1998) (RS:2004)
Delano	1982-93, 95-96, 2005	(b:1982-91) (e 1992) (g 1993) (RS:2005)
Kimball	1983-85,98,04	(b:1983-85) (f:1998) (RS:2004)
Louisa	1981-85,98, 2005	(b:1983-85) (f:1998) (RS:2005)
Nunikani	1983-85,98, 2005	(b:1983-85) (f:1998) (RS:2005)
Sherborne	1982-85,95,98,99, 2005	(b:1982-85) (g:1995) (f:1998) (g:1999) (RS:2005)
Smoke	1981-85,98, 2005	(b:1981-85) (f:1998) (RS:2005)
Timberwolf	1982-85,94, 2005	(b:1982-85) (f:1994) (RS:2005)
Westward	1981-95,98-2006	(b:1981-91) (e 1992-93) (f 94) (g 95) (f:98) (g:99-2006) (RS:2004)
		Sensitive Lakes
Bat	1986-95,98, 2004	(b:1986-91) (f:1992-1994) (g:1995) (f:1998) (RS:2004)
Clara	1986-1992	(b:1986-91) (f:1992)
Cradle	1986-93, 2005	(b:1986-91) (f:1992) (g:1993) (RS:2005)
Crystal	1986-93, 2005	(b:1986-91) (f:1992) (g:1993) (RS:2005)
Drummer	1986-1992	(b:1986-91) (f:1992)
Hamer	1988-95,98-05	(g:1988-89) (b:90-91) (e:92-93) (f:94) (g:95) (f:98) (g:99-2005) (RS:2004)
Louck's	1986-1992	(b:1986-91) (f:1992)
Little Eastend	1986-1992	(b:1986-91) (f:1992)
Little Whetstone	1988-1992	(b:1986-91) (f:1992)
Maggie	1986-92, 2005	(b:1986-91) (f:1992) (RS:2005)
Pearceley	1986,88-95,(1998-2005	(g:1988) (b:1988-91) (e:1992-93) (f:1994) (g:1995) (f:1998)
Pearceley cont'd		(g:99-2005) (RS:2005)
Pincher	1986-95, 2005	(b:1986-91) (e:1992) (g:1993-94) (RS:2005)
Round	1986-1992	(b:1986-91) (f:1992)
Shoelace	1986-1992	(b:1986-91) (f:1992)
Skidway	1986-1994	(b:1986-91) (e:1992) (g:1993-1994, 2000)
Sunset	1986-1992	(b:1986-91) (f:1992)
Windfall	1986-1992	(b:1986-91) (f:1992)
Young	1988-95,98-2004	(g:1988-89) (b:90-91) (e:92-93) (f:94) (g:95) (f:98) (g:99-2006) (RS:2004)

cont'd

Table 2a cont'd. Multi basin sample locations established 1986- -1989 showing field ID
Study period and frequency. **a** weekly(1976-82) bi-weekly (1983-2006), **b** monthly,
c 6 times/year, **d** 5 times/year, **e** 3 times/year, **f** twice/year, **g** once/year, ***** whole lake only, **h** MLFAU**, RS** monthly

	Lake	Study Period	Ice-free Season Sampling Frequency
	Lake Muskoka		
IM1	Gravenhurst Bay	1986-1995	(a 1986-88) (b:1989) (h:1990-92) (b:1993) (c:1994-95)
IM2	South Bay	1986,88-95	(b:1986, 88-89) (h:1990-92) (b:1993) (c:1994-95)
IM3	Stephen's Bay	1986-1995	(b:1986-89) (h:1990-92) (f:1993) (c:1994) (g:1995)
IM4	Birch Is. (East)	1986-1995	(b:1986-89) (h:1990-92) (b1993) (c:1994) (d:1995)
IM5	Walker's Point	1986,90-95	(b:1986) (h:1990-92) (b:1993) (c:1994-95)
IM6	Pine Needle Pt	1986-1995	(b:1986-89) (h:1990-92) (f:1993) (c:1994) (g:1995)
IM7	Bala Bay	1986, 90-95	(b:1986) (h:1990-92) (b 1993) (c:1994) (d:1995)
IM8	Dudley Bay	1986-1995	(b:1986-89) (h:1990-92) (f:1993) (c:1994) (d: 1995)
IM9	North Bay	1986,90-95	(b:1986) (h:1990-92) (f:1993) (c:1994) (g:1995)
IM10	East Bay	1986,90-95	(b:1986) (h:1990-92) (b:1993) (c:1994) (d:1995)
IM11	Crown Island	1986,90-95	(b:1986) (h:1990-92) (f:1993) (c:1994) (d:1995)
IM12	Mirror Lake	1986-93,95	(b:1986-89) (h:1990-92) (f:1993) (d:1995)
IM13	Muskoka Bay	1986-1995	(a 1986-88) (b:1989) (h.:19-1992) (b:1993) (c:1994-95)
IM14	Cliff Bay	1987-1993	(a 1987-88) (b:1989) (h.:19-1992) (f:1993)
	Lake Joseph		
IJ1	Fraser Island	1986-1995	(b:1986-89) (h:1990-92) (b:1993) (c:1994-95)
IJ2	Hamer Bay	1986, 1990-95	(b:1986) (h:1990-92) (f:1993) (c:1994) (g:1995)
IJ3	Gordon Bay	1986-1995	(b:1986-89) (h:1990-92) (f:1993)(c:1994) (g:1995)
IJ4	Yoho Island	1986, 1990-95	(b:1986) (h:1990-92) (b:1993) (c:1994) (d:1995)
IJ5	L.L. Joseph	1986-1995	(b:1986-89) (h:1990-92) (b:1993) (c:1994-95)
IJ6	Chief's Island	1986-1995	(b:1986) (h:1990-92) (b:1993) (c:1994) (g:1995)
IJ7	Joseph River	1986-1995	(b:1986-89) (h:1990-92) (f:1993) (c:1994) (g:1995)
IJ8	Bagerow Island	1986, 1990-95	(b:1986) (h:1990-92) (b:1993) (c:1994-95)
IJ9	Footes Bay	1986-1995	(b:1986-89) (h:1990-92) (b 1993) (c:1994) (d:1995)
IJ10	Black Forest Is	1986, 1990-95	(b:1986) (h:1990-92) (b:1993) (c:1994) (d:1995)
IJ11	Cox Bay	1986-1995	(b:1986-89) (h:1990-92) (b:1993) (c:1994-95)
	Lake Rosseau		
IR1	Cameron Bay	1986-1995	(b:1986-89) (h:1990-92) (f:1993) (c:1994) (g:1995)
IR2	Morgan Bay	1986-1995	(b:1986-9) (h:1990-92) (f:1993) (c:1994) (g:1995)
IR3	Wiley's Bay	1986, 1990-95	(b:1986) (h:1990-92) (f:1993) (c:1994) (g:1995)
IR4	Skeleton Bay	1986-1995	(b:1986-89) (h:1990-92) (b:1993) (c:1994-95)
IR5	Rest Harbour	1986, 1990-95	(b:1986) (h:1990-92) (f:1993) (c:1994) (g:1995)
IR6	Tobin Island	1986, 1990-95	(b:1986) (h:1990-92) (b:1993) (c:1994-95)
IR7	Portage Bay	1986-1995	(b:1986-89) (h:1990-92) (b:1993) (c:1994-95)
IR8	Brackenrig Bay	1986-1995	(b:1986-89) (h:1990-92) (b 1993) (c:1994-95)
IR9	Arthurlie Bay	1986-1995	(b:1986-89) (h:1990-92) (f:1993) (c:1994) (f:1995)
IR10	Minette	1986-1995	(b:1986-89) (h:1990-92) (f:1993) (c:1994) (f:1995)
IR11	Venetia Group	1986, 1990-95	(b:1986) (h:1990-92) (b 1993) (c:1994-95)
IR12	Mutchinbaker Bay	1986, 1990-95	(b:1986) (h:1990-92) (b 1993) (c:1994-95)

cont'd

Table 2a cont'd Multi basin sample locations established 1986- -1989 showing field ID

Study period and frequency. **a** weekly(1976-82) bi-weekly (1983-2006), **b** monthly,
c 6 times/year, **d** 5 times/year, **e** 3 times/year, **f** twice/year, **g** once/year, ***** whole lake only, **h** MLFAU**, RS** monthly

Lake		Study Period	Ice-free Season Sampling Frequency
	Lake of Bays		
IB1	Pancake Bay	1986-1989	(b:1986-89)
IB2	Trading Bay	1986-1989	(b:1986-89)
IB3	Rabbit Bay	1986-1989	(b:1986-89)
IB4	Ten Mile Bay	1986	(b:1986)
IB5	Bigwin Island	1986	(b:1986)
IB6	Haystack Bay	1986	(b:1986)
IB7	Dwight Bay	1986-1989	(b:1986-89)
IB8	Partage Bay	1986-1989	(b:1986-89)
IB9	Seagull	1986	(b:1986)
IB10	Roothog Island	1986	(b:1986)
IB11	Whitehouse Bay	1986-1989	(b:1986-89)
IB12	Whiskey Bay	1986 + (870609)	(b:1986 + 870609)
IB13	Burnt Island	1987-1989	(b:1987-89)
	Lakeshore Capacity Study "Export" watersheds		
Paint inlet 1		1976-1992	(a: 1976-92)
Trading Bay inlet 1		1976-1992	(a: 1976-92)
12 Mile inlet 1 North		1976-1992	(a: 1976-92)
12 Mile inlet 1 South		1976-1992	(a: 1976-92)
Beech inlet 1		1976-1992	(a: 1976-92)
Duck inlet 1		1976-1992	(a: 1976-92)
Head inlet 1		1976-1992	(a: 1976-92)
Haliburton Lk. inlet 12		1976-1992	(a: 1976-92)
Moose inlet 1		1976-1992	(a: 1976-92)
	Lake Nipissing		
N1 / IG1	Yellek Point	1975 / 1988 -90	(b 1975 / 1988 -90)
N2 / IG2	Beaucage Point	1975 / 1988 -90	(b 1975 / 1988 -90)
N3 / IG3	Meadowside	1975 / 1988 -90	(b 1975 / 1988 -90)
N4 / IG4	Dukis Point	1975 / 1988 -90	(b 1975 / 1988 -90)
N5 / IG5	Mouseau Point	1975 / 1988 -90	(b 1975 / 1988 -90)
N6 / IG6	Sturgeon R. Chl.	1975 / 1988 -90	(b 1975 / 1988 -90)
N7 / IG7	Cache Bay	1975 / 1988 -90	(b 1975 / 1988 -90)
E23 / IG8	Manitou Isl. East	1975 / 1988 -90	(b 1975 / 1988 -90)
E24 / IG9	Callander Bay	1975 / 1988 -90	(b 1975 / 1988 -90)
E25 / IG10	Second Rocky Point	1975 / 1988 -90	(b 1975 / 1988 -90)
/ IG11	North Bay Diffuser	1988 - 1990	(b 1988 -90)
S16 / IG12	Cambell's Point	1975 / 1988 -90	(b 1975 / 1988 -90)
S18 / IG13	Cross Point	1975 / 1988 -90	(b 1975 / 1988 -90)
S19 / IG14	Jessop Isl. West	1975 / 1988 -90	(b 1975 / 1988 -90)
S20 / IG15	South B. Durrell Pt.	1975 / 1988 -90	(b 1975 / 1988 -90)
W9 / IG16	Hardwood Isl. N.	1975 / 1988 -90	(b 1975 / 1988 -90)
W10 / IG17	Gull Isl. East	1975 / 1988 -90	(b 1975 / 1988 -90)
W11 / IG18	Hay Narrows	1975 / 1988 -90	(b 1975 / 1988 -90)
W12 / IG19	West Bay East	1975 / 1988 -90	(b 1975 / 1988 -90)
C8 / IG20	Little Oak Isl.S.	1975 / 1988 -90	(b 1975 / 1988 -90)
C14 / IG21	Iron Isl. West	1975 / 1988 -90	(b 1975 / 1988 -90)
C15 / IG22	Iron Isl. East	1975 / 1988 -90	(b 1975 / 1988 -90)
C21 / IG23	Manitou Isl. West	1975 / 1988 –90	(b 1975 / 1988 -90)

cont'd

Table 2a cont'd Multi basin sample locations established 1986- -1989 showing field ID
Study period and frequency. **a** weekly(1976-82) bi-weekly (1983-2006), **b** monthly,
c 6 times/year, **d** 5 times/year, **e** 3 times/year, **f** twice/year, **g** once/year, ***** whole lake only, **h** MLFAU**, RS** monthly

Lake	Study Period	Ice-free Season Sampling Frequency
C22 / IG24Burritt Isl. South	1975 / 1988 -90	(b 1975 / 1988 -90)
F1 / IG25Chaudiere Dam	1975 / 1988 -90	(b 1975 / 1988 -90)
F2 / IG26Little Chaudier Dam	1975 / 1988 -90	(b 1975 / 1988 -90)
Sample Frequencey for the Lake Nipissing studies were (b) monthly as 0 - 5m water column composites		

Table 2b. Rice and Sturgeon Lakes Nutrient Budget Study 1986 - 1989 flow weighted sampling regime used by local observers at tributary water quality monitoring stations**.**

Station Classification	**Stream Magnitude**	**Collection Frequency**	**Annual Sample Total**
Class 1	High Flow	2 / day	70
(9 stations *)	Medium Flow	2 / week	20
	Low Flow	2 / month	18
	Annual Total per Station		*110*
Class 2	High Flow	1 / day	35
(3 stations **)	Medium Flow	2 / week	20
	Low Flow	2 / month	18
	Annual Total per Station		*75*
Class 3	High Flow	2 / week	20
(3 stations ***)	Medium Flow	1 / week	10
	Low Flow	2 / month	18
	Annual Total per Station		*50*
Class 4	High Flow		up to 12 / year
(all 15 stations)			
(by consultant)	Other Flows		1 per month

* Bewdley North, Bewdley South, McLaren, Rutherford, Hawkers, Martin, Emily and Dunsford Creeks , Ouse River.
** Indian, Otonabee and Scugog Rivers.
*** Trent River at Hastings, Big Bob Channel and Fenelon Falls.

Table 2c Multiple basin sample locations, 1986 -1989 showing field ID, and station codes for Rice and Sturgeon lakes [from Hutchinson et al. (1994b,1994c, 1994d)].

Station	Location Description	Study Period
BYN	(Bewdley North) Unnamed creek at Hwy 28, North of Bewdley, Ont.	1986 -89
BYS	(Bewdley South) Unnamed creek at C.R.9, South of Bewdley, Ont.	1986 -89
IR1	Indian River at C.R.2, Keene Ont.	1986 -89
OE1	Ouse River at C.R.2, Birdsalls, Ont.	1986 -89
OT1	Otonabee River at Cambellville, Ont.	1986 -89
TT1	Trent River at Hwy 45, Hastings, Ont.	1986 -89
RE33	Rice Lake near Bewdley	1986 -89
RE34	Rice Lake near Spook Island	1986 -89
RE35	Rice Lake near Hickory Island	1986 -89
RE36	Rice Lake near Margaret Island	1986 -89
ML1	McLaren Creek at 1st Conc. upstream of Hwy. 35	1986 -89
RD1	Rutherford Creek at C.R.10	1986 -89
HK1	Hawkers Creek at C.R.8	1986 -89
MN1	Martin Creek at C.R.8	1986 -89
EY1	Emily Creek at Hwy. 36	1986 -89
CA1	Cameron Lake Outflow at Hwy. 121, Fenelon Falls	1986 -89
SG1	Scugog River at Lock 33, Lindsay	1986 -89
SG2	Scugog River at old Railway Bridge, Lindsay	1986 -89
BB1	Sturgeon Lake Outflow at Hwy. 36, Bobcaygeon	1986 -89
SN6	Sturgeon Lake near Buoy C559	1986 -89
SN7	Sturgeon Lake mid-lake near Snug Harbour	1986 -89
SN8	Sturgeon Lake near Bouy CP45	1986 -89
SN9	Sturgeon Lake off Sturgeon Point	1986 -89
SN10	Sturgeon Lake mid-lake near Thurstonia Park	1986 -89
SN11	Sturgeon Lake near Bouy C590	1986 -89

3. CHEMICAL PARAMETER TEST GROUPS FOR ROUTINE PROGRAMMES

The station identification and sample submission procedures used from 1986 to 1994 are described in McCormick (1988a, 1988b). Changes to these procedures occurred in March 1995, at which time the Lab Information System (LIS) was replaced by the Laboratory Information Management System (LIMS). Details of chemical parameter test groups for routine lake sampling programmes are presented in Tables 3a (1986 -94), 3b, 3c, 3d, 3e (1995-2000), 4a (LIS 1986-94) and 4b (LIMS 1995-2003). An overall summary of the changes in the protocols employed to analyze water samples (1973-2006) is presented in Table 4c. The chemistry database, identification numbers for each station are presented in Table 7a and were previously reported in Nicolls (1986), McCormick (1988b) and Lazerte (1990).

A comprehensive quality-control study was undertaken in 1983 to evaluate the effects of sample collection and analytical procedures on variation in the precision of each chemical parameter. Details of this comparison are presented in Locke (1990). The quality assurance management programme was presented in an earlier report (Locke 1985).

The chemical conversion factors employed to change mass units ($\mu g \cdot L^{-1}$ or $mg \cdot L^{-1}$) into micro equivalents ($\mu eq \cdot L^{-1}$) are presented in Appendix 6. Annual ice-free lake chemistry summaries have additionally included the following calculations.

Monovalent to Divalent ratio in $\mu eq\ L^{-1}$ is calculated as: (Na + K) / (Ca + Mg)

The sum of the anions and cations are directly available from the Chemistry database

Cumulative Nitrogen ($\mu g\ L^{-1}$) **and total inorganic nitrogen to total nitrogen ratio** is calculated as:

Total organic nitrogen = (TKN – NH_4 –N)

where organic nitrogen = NNTKUR minus NNHTFR

Total inorganic nitrogen = ($NO_{2,3}$ + NH_4 –N)

where inorganic nitrogen = NNOTFR plus NNHTFR

Total nitrogen = (TKN + $NO_{2,3}$)

where total nitrogen = NNTKUR plus NNOTFR

The total inorganic nitrogen to total nitrogen ration calculation is:

= (($NO_{2,3}$ + NH_4 –N) / (TKN + $NO_{2,3}$)

where the ratio = (NNOTFR plus NNHTFR) divided by (NNTKUR plus NNOTFR)

Table 3a. Lab Information System (LIS) Chemical parameter test groups for routine sampling programmes(1986 – 1994)

Test Group Code	Test Group Name	Parameters Included[1]
DL1	Lakes Group 1	NNOTFR, NNHTFR, PPUT1, PPUT2, DIC, pH, ALKTI, ALKT, COND25, NNTKUR,CAUR, MGUR, NAUR, KKUR, FFIDUR, CLIDUR, SS04UR, SI03UR, DOC, FEUT, MNUT, ALKT3, (ALUT 1987 to 1994) DLI LAKES (HYPOLIMNION PROFILE GROUP)[2]
DL2	Lakes Group 2	CHLRAC, CLHRAT (CHLRBT DELETED AUG. 1986)
DL4	Lakes Group 4	NNOTFR, NNHTFR, PPUT1, PPUT2, DIC, pH, ALKTI, ALKT, COLTR, COND25, NNTKUR, CAUR, MGUR, NAUR, KKUR, FFIDUR, CLIDUR, SS04UR, SI03UR, DOC, ALKT3, FEUT
DALCV	Aluminum Speciation	ALNDCV, ALEXCV
DM2	Metals Group 2	CDUT, CUUT, NIUT, PBUT, ZNUT
DLP	Lake Profiles	DO, DIC, pH
PRIVATE LAB TEST GROUPS (INLAND LAKES STUDIES on Lake Nipissing , the Muskoka Lakes Project and the Rice & Sturgeon Lakes Nutrien Budget Study)[3]		
BKIL1	Beak Consultants Analysis Tests	CAUR, MGUR, NAUR, KKUR, SI03UR, SSO4UR, CLIDUR, COLTR, COND25, DOC, DIC, pH, ALKT, PPUT1, PPUT2, NNTKUR, NNHTFR, NNOTFR, ALKTI
TRILT	Rexdale Lab	FEUT, MNUT, ALUT

1 Table 3b. Parameter Codes - Routine Dorset Site Requests.
2 The Hypolimnion Profile Group was identical to the DL1 group (Lakes, not Streams DL1) except for the following five parameters: MGUR, CLIDUR, CAUR, NAUR, KKUR.
3 Lake profile pH, DIC submitted to Beak Lab, Lake profile DO submitted to Dorset Lab.

Table 3b. Laboratory Information Management System (LIMS) Chemical parameter test groups for routine sampling programmes (1995 -2006).

LIMS parent product names	product included
DRCLKA	ammno3374, dtkn3367, tp3036 carb3028, cond3024, phalk3042 cat3249, anion3147, dorcsi3370 (femn3303, al3300)[1], col3025[2]
DRCLKB	ammno3374, dtkn3367, tp3036 phalk3042, cat3249, anion3147
DRCCHLO	dchl3169
DRCPROF	do3026, ph3042, carb3028

1. Moved tests to Rexdale MOE Lab Feb. 1999
2. Added test June 1996 and moved test to Rexdale MOE Lab Feb. 1999

Table 3c. Dorset (DESC) Parameter codes and LIMS product names (1995 -2006).

DORSET (DESC) TESTS

Abbreviation	Description	LIMS Product name
pH	pH	PH3042
PH	pH	PHALK3042
ALKTI	Total inflection point alkalinity	
ALKT	Total fixed end point alkalinity to pH 4.5	
ALKT3	(Total fixed end point alkalinity to pH 3.8) deleted June 1996	
COLTR	(True colour) added to DRCLKA June 1996	COL3025
	Removed COL3025 Feb. 1999 and replaced with	COL3219
COND25	Conductivity (at 25 degrees Celsius)	COND3024
NNHTFR	Ammonium	AMMNO3374
NNOTOFR	Nitrate + Nitrite	
PPUT1	Total Phosphorus	TP3036
DIC	Dissolved inorganic carbon	CARB3028
DO	Dissolved oxygen	DO3026
CUUT	Total copper	CUGF3376
CDUT	Total cadmium	CDGF3376
ALUT	Total aluminum	AL3300
FEUT	Total iron Moved fron DRC to Rexdale Feb. 1999	FEMN3303
MNUT	Manganese	
FEUT	Total iron	FE3303
SSO4UR	Sulphate as SO4	ANION3147
CLIDUR	Chloride	
CAUR	Calcium	CAT3249
MGUR	Magnesium	
NAUR	Sodium	
KKUR	Potassium	
HARDT	(Hardness) deleted June 1996	
HGUR	Mercury	HG3396

Table 3d. Ministry of the Environment (Laboratory Services Branch, Toronto) test parameter codes and LIMS product names (1995 -2006).

Toronto surface/ground water tests

Abbreviation	Description		LIMS Product Name
NNTKUR	Total Kjeldahl nitrogen 2001 Moved Rexdale test to Dorset replaced with		DTKN3367 DTKN3424
DOC SIO3UR	Dissolved organic carbon 2001 Silicates as SiO2 changed to		DORCSI3370 DORSCI3422
RSP			SS3365
TURB	Turbidity		TURB3311
CHLRAC CHLRAT	Chlorophyll acid a Chlorophyll a		DCHL3169
NIUT CDUT CUUT ZNUT PBUT 11 Additional Metal Analyzed	Total nickel Total cadmium Total copper Total zinc Total lead	MET3386[1] (MET 3080	Aug. 8 1994 to Sept. 24, 1996) (includes Al, Fe, Mn, -soil leachates by icp/ms) - WL matrix

1. Methods change: new method (MET 3386) uses a ultrasonic nebulizer and requires only 10 - 15 ml. sample compared to 500 ml. The same instrument is used only the sample preparation part of the method has changed.

3.1 CHEMICAL SAMPLING METHODS

The chemical sampling methods employed by field personnel of the Dorset Environmental Science Centre were initially presented by Scheider et al. (1983), Locke and Scott (1986) and Girard and Reid (1990). These reports summarized the methodology for hydrological gauging, lake, stream, and precipitation chemical sampling and biological sampling in the Muskoka-Haliburton study area during 1976 - 1989. Similarly, Clark (1996) presented detailed collection methods for water chemistry, plankton and benthos within the Muskoka Lakes (Muskoka, Rosseau and Joseph) for the period 1986 - 1993. The most recent methodology is presented in Ingram et al. (2006) in which the routine sampling and equipment calibration techniques are discussed.

The field staff of the Dorset Environmental Science Centre have always worn "Powder-free vinyl gloves [1]" (see footnote in Table 3e) while pouring sample water for lakes, streams and precipitation and when filtering these samples through 80 μm polyester mesh into the appropriate sample bottles or tubes. The filters are transported and stored in sealed nalgene bottles containing double deionized distilled water prior to use in the lab or field (lake or stream). As a result of these measures, coarse particulates are removed and handling contamination reduced which might otherwise interfere with the analysis results and /or equipment. Similarly the field personnel are protected from potential or actual danger of sample handling. Thorough quality assurance has been performed on the gloves, filter material, bottles and tubes in order to ensure a high degree of data integrity (Locke 1985, Locke 1990).

The current sample submission methods to the Ontario Ministry of the Environment (MOE) and Trent University (Trent) Labs at the Dorset Environmental Science Centre are presented in Ingram et al. (2006). The chemical parameters described in Tables 3c, and 3d currently represent the test descriptions required for sample analysis requests. The sample bottles required for these specific parameters are listed below in Table 3e. The quality control/quality assurance programme for the Lakeshore Capacity Study and the Acid Precipitation in Ontario Study is reported in Locke (1986, 1990).

Table 3e LIMS chemical parameters and required sample submission bottle types.

LIMS Product Name	Minimum Volume	Container Type	LIMS Product Name	Minimum Volume	Container Type
PHALK3042	30 ml	250 ml brown nalgene	DTKN3424	75 ml	inclusive of above bottle
PH3042	30 ml	30ml Starplex	TP3036	50 ml x 2	duplicate Kimax Tubes submitted as separate tests
COL3025	30 ml	480 ml PET bottle	CARB3028	50 ml	Kimax Tube
COND3024	30 ml	inclusive of above bottle	HG3396	250 ml	BOD bottle w/ glass stopper
AMNNO3374	30 ml	inclusive of above bottle	DCHL3169	1000 ml	Brown Nalgene
DORSCI3422	30 ml	inclusive of above bottle	MET3386	80 ml	480 ml Polyethylene
ANION3147	30 ml	inclusive of above bottle			
CAT3249	30 ml	inclusive of above bottle			

[1.] "Powder free vinyl gloves" supplier OAK Technical Inc. Subsidiary of Oak Rubber Company

The various profile sampling protocols within specified study lakes (Table 4a, 4b) include dissolved oxygen (DO), pH and dissolved inorganic carbon (DIC) and hypolimnion chemistry taken at odd- metre interval. Profile sets of dissolved oxygen (DO), pH and DIC are sampled at odd metre depths from 1 m to the maximum depth. Beginning in 1993, profile samples for all lakes were collected from an initial depth of 0.1 m. For each of the "A" lakes, DO profile samples were collected at every metre throughout the hypolimnion (Table 4a legend superscript 4). The study in Chub Lake (1986-92) and in Plastic (1989-92) sampled the hypolimnion at odd-metre intervals for water chemistry (Table 3a, 4a - Hypolimnion Profile Group). DO determination changed (Mar 01, 93) from the Winkler titration method to use of a YSI (model 59) DO meter with a 5730 probe. Daily summaries for temperature, DO, pH and DIC are presented in a series of Data Reports prepared by Girard and Reid (1991a - 1991o). In May 1996 the collection of *in situ* DO was initiated, using a Model 58 YSI meter equipped with a Model 5739 (YSI) Oxygen probe (1996 - 2006) or the YSI model 95 digital oxygen/temperature meter (1998 - 2006). Occasionally (1998 - 2006) samples were analysed for DO in the lab to confirm anoxia, and to protect the field YSI 5739 probes low level detection integrity.

Table 4a. Study lakes: chemical test groups (LIS 1986 - 1994).

Lake/Station Designation (Table 1)	Parameter Test Group Group Table 3.a, b or Parameters	Sample Strategy	Year
A, B, C, Sensitive Lakes[1]	DL1	stratified or whole lake sample[2]	1986 -94
	DL2	euphotic zone or 0-6 m[3]	1986 -94
	DLP	ever 2m from 1m to Zmax[4]	1986 -94
	DM2	whole lake samples	1986 -94
Chub Lake	DL1	hypolimnetic profile[5]	1986 -92
Plastic Lake	DL1	hypolimnetic profile	1986 -92
Sudbury	DL1, DM2	whole lake samples	1986 -94
	DL2	euphotic zone or 0-6m	1986 -94
	DALCV	whole lake samples	1985 -94
Inland Lakes			
All Inland Lakes Stations[6]	DL4	stratified or whole lake samples	1986 -89
	DL2	euphotic zone or 0-6 m	1986 -89
	BKIL1, TRILT, (ALKT3+FFIDUR)[7]	stratified or whole lake samples	1989 -91
	DO[8]	4 depths in the hypolimnion	1986
Exceptions:			
Lake of Bays			
IB1-IB12	DL1, DL2		1986 -88
IB13	DL1, DL2		1987 -89
IB1-IB13	BKIL1, TRILT, ALKT3+FFIDUR)		1989 -91
	DO		1986
IB1	DLP[9]		1986 -89
Lake Muskoka			
IM1, IM13, IM14	DL1, DL2		1986 -88
	BKIL1, TRILT, (ALKT3 & FFIDUR)		1989
	DO		1986
	DLP		1986 -89

[1] Lake location - Table 7.
[2] Stratified samples during thermal stratification and whole lake during the non-stratified season.
[3] Euphotic zone (2x Secchi) samples during the ice-free season and 0-6 m samples during the ice covered season.
[4] Dissolved oxygen in the "A" lakes at every meter in the hypolimnion (BC-14m, CN-16m, DE-8m, HP-16m, HY-2m, PC-10m, RCE-14m, RCM-26m, CB-16m).
[5] Hypolimnion sampled every 2m for DL1 with the parameter exceptions noted in Table 3.
[6] All stations include (a) Lake Muskoka (except IM1, IM13, IM14); (b) Lake Rosseau (IR1-IR12); (c) Lake Joseph (IJ1-IJ11) from Table 8. and Nipissing, Rice & Sturgeon Lakes in Table 9.
[7] BKIL1, TRILT analyzed by Beak Consultants and ALKT3 & FFIDUR analyzed in the Dorset Lab.
[8] DO sampled every 2m intervals at IM6, IM8, IJ5, IJ8, IJ11, IR1, IR4 from 1987 -89.
[9] DO analyzed at the Dorset Lab and pH and DIC are analyzed by Beak Consultants in 1989.

Table 4b. Study lakes: chemical test groups (LIMS 1995 - 2006).

Lake/Station Designation (Table 1)	Parameter Test Group From (Table 2d) or Parameters	Sample Strategy	Year
A[1], B	DRCLKA DRCCHLO DRCPROF	stratified or whole lake sample[2] euphotic zone or 0-6 m[3] ever 2m from 1m to Zmax[4]	1995 - 2006
Sudbury[2]	DRCLKA, MET3386 DRCCHLO	whole lake samples euphotic zone or 0-6m	1995 - 2006

1. Dissolved oxygen in the "A" lakes at every meter in the hypolimnion (BC-14m,CN-16m, DE-8m, HP-16m, HY-2m, PC-10m, RCE-14m, RCM-26m, CB-16m).
2. Sudbury lakes Clearwater, Hannah, Middle and Lohi 1998 - 2006 were sampled by Laurentian University/ Co- op (John Gunn / Bill Keller MOE)

Refer to Appendix 6 for Chemical Parameter Conversion Factors.

3.2 MINISTRY OF ENVIRONMENT - LABORATORY FINAL REPORT REMARKS CODES

Chemistry database retrievals should include the laboratory remarks codes in order that the missing or invalid data may be identified and examined for editing. The following list includes only the most common codes reported in association with DESC sample submissions. Additional report codes are available from the Laboratory Services Branch database table: see Appendix 8 moe_valqualifiers under the sub group: rp_valqualifiers.

<=W	no measurable response (zero): < reported value
<W	no measurable response (zero): < reported value
<T	a measurable trace amount: interpret with caution
DP	duplicate
+/-	result obtained is +/- value indicated
NDNR	no data: sample not received
NDI	no data: insufficient
NDID	no data insufficient data to perform calculation

Table 4c. Summary of long-term changes in the protocols employed to analyze water samples from the lakes studied by the DESC, including Analytical Method Codes 1973 – 2006 * Analytical Methods codes are supported by the Laboratory MOE Services Branch, Customer Services, Research & Reference Scientist

Parameter	Code	Method	Start	End	Reported Units
ALKALINITY; total fixed.	ALKT	000A	5/19/75	10/15/80	mg $\bullet L^{-1}$ as $CaCO_3$
end point to pH 4.5		0	5/12/81	10/21/85	mg $\bullet L^{-1}$ as $CaCO_3$
		0905T3	11/19/85	11/3/94	mg $\bullet L^{-1}$ as $CaCO_3$
		E3042A	5/11/95	8/20/97	mg $\bullet L^{-1}$ as $CaCO_3$
		E3289A	5/26/98	9/22/98	mg $\bullet L^{-1}$ as $CaCO_3$
end point to pH 3.8	ALKT3	0905T3	11/19/85	11/3/94	mg $\bullet L^{-1}$ as $CaCO_3$
		E3042A	5/11/95	to-date	mg $\bullet L^{-1}$ as $CaCO_3$
total inflection alkalinity	ALKTI	0	6/5/78	10/21/85	mg $\bullet L^{-1}$ as $CaCO_3$
		0905T6	11/19/85	11/3/94	mg $\bullet L^{-1}$ as $CaCO_3$
		E3042A	5/11/95	to-date	mg $\bullet L^{-1}$ as $CaCO_3$
ALUMINUM	ALUT	0	6/23/75	10/20/81	$\mu g \bullet L^{-1}$
		522AA5	5/12/82	5/3/83	$\mu g \bullet L^{-1}$
		0	6/1/83	10/21/85	$\mu g \bullet L^{-1}$
		005AF2	11/19/85	8/7/91	$\mu g \bullet L^{-1}$
		E3299A	5/19/92	11/3/94	$\mu g \bullet L^{-1}$
		E3300A	5/11/95	to-date	$\mu g \bullet L^{-1}$
ANIONS	COMPUTED	E3196A	5/13/81	10/15/01	$\mu eq \bullet L^{-1}$
		ANION3147	10/15/01	to-date	$\mu eq \bullet L^{-1}$
CATIONS	COMPUTED	E3196A	5/13/81	10/15/01	$\mu eq \bullet L^{-1}$
		CAT3249	10/15/01	to=date	$\mu eq \bullet L^{-1}$
CALCIUM	CAUR	000B	7/19/73	10/15/80	$mg \bullet L^{-1}$
		0	2/2/81	10/20/81	$mg \bullet L^{-1}$
		002BA1	5/12/82	6/25/85	$mg \bullet L^{-1}$
		0901A1	7/22/85	7/5/88	$mg \bullet L^{-1}$
		002CA1	8/2/88	11/3/94	$mg \bullet L^{-1}$
		E3249A	5/11/95	to-date	$mg \bullet L^{-1}$
CHLOROPHYLL a;	CHLRAC	0	5/15/74	5/12/82	$\mu g \bullet L^{-1}$
		002CS1	5/25/82	7/3/84	$\mu g \bullet L^{-1}$
		002DS1	7/30/84	11/23/87	$\mu g \bullet L^{-1}$
		ZE002A	3/16/88	2/15/89	$\mu g \bullet L^{-1}$
		002DS2	4/18/89	11/3/94	$\mu g \bullet L^{-1}$

Table 4c. cont'd Analytical Method Codes 1973 – 2006

Parameter	Code.	Method	Start	End	Reported Units
		E3169A	5/11/95	to-date	µg • L^{-1}
		0	2/2/81	5/12/82	µg • L^{-1}
CHLOROPHYLL a; total	CHLRAT	000B	6/26/73	10/15/80	µg • L^{-1}
		002AS1	5/25/82	7/3/84	µg • L^{-1}
		002DS1	7/30/1984	6/25/1985	µg • L^{-1}
		002DS2	7/22/1985	11/23/1987	µg • L^{-1}
		ZE002A	12/7/1987	2/15/1989	µg • L^{-1}
		002DS2	3/23/1989	11/3/1994	µg • L^{-1}
		E3169A	5/11/1995	to-date	µg • L^{-1}
CHLOROPHYLL b	CHLRBT	000B	6/26/73	10/15/80	µg • L^{-1}
		0	2/2/81	5/12/82	µg • L^{-1}
		002BS1	5/25/82	7/3/84	µg • L^{-1}
		002DS2	7/22/1985	7/30/1986	µg • L^{-1}
CHLORIDE	CLIDUR	000A	5/19/1975	10/15/1980	mg • L^{-1}
		0	6/9/1981	10/20/1981	mg • L^{-1}
		004AC2	5/12/1982	3/13/1986	mg • L^{-1}
		004AC1	4/7/1986	10/26/1987	mg • L^{-1}
		004BC2	11/23/1987	9/13/1993	mg • L^{-1}
		005AI0	10/28/1993	11/3/1994	mg • L^{-1}
		E3147A	5/11/1995	to-date	mg • L^{-1}
CONDUCTIVITY	COND25	0	6/26/1973	10/21/1985	μmhos • cm^{-1}
		0903CM	11/19/1985	10/22/1990	μmhos • cm^{-1}
		002B12	6/3/1991	11/3/1994	μmhos • cm^{-1}
		E3024B	5/11/1995	to-date	μmhos • cm^{-1}
COPPER	CUUT	000A	6/26/1973	10/15/1980	µg • L^{-1}
		0	5/12/1981	10/20/1981	µg • L^{-1}
		522AA1	5/12/1982	12/7/1983	µg • L^{-1}
		522AE2	5/21/1985	11/3/1994	µg • L^{-1}
		E3080A	5/11/1995	8/20/1996	µg • L^{-1}
		E3386A	9/13/1996	to-date	µg • L^{-1}

Table 4c. cont'd Analytical Method Codes 1973 - 2006

Parameter	Code	Method	Start	End	Reported Units
DISSOLVED INORGANIC	DIC	0	2/2/1981	10/20/1981	$mg \cdot L^{-1}$
CARBON		102AC2	5/12/1982	6/21/1982	$mg \cdot L^{-1}$
		0	8/16/1982	10/21/1985	$mg \cdot L^{-1}$
		1127C2	11/19/1985	11/3/1994	$mg \cdot L^{-1}$
		E3028A	5/11/1995	to-date	$mg \cdot L^{-1}$
DISSOLVED ORGANIC	DOC	000A	5/27/1977	7/20/1977	$mg \cdot L^{-1}$
CARBON		0	2/2/1981	10/20/1981	$mg \cdot L^{-1}$
		102AC2	5/12/1982	11/3/1994	$mg \cdot L^{-1}$
		E3370A	5/11/1995	8/20/1997	$mg \cdot L^{-1}$
		DORCSi3370	8/20/1997	to-date	$mg \cdot L^{-1}$
IRON	FEUT	0	6/26/1973	10/20/1981	$\mu g \cdot L^{-1}$
		504AC2	5/12/1982	5/21/1985	$\mu g \cdot L^{-1}$
		522AE2	6/25/1985	6/12/1989	$\mu g \cdot L^{-1}$
		001AE5	8/8/1989	11/7/1991	$\mu g \cdot L^{-1}$
		E3296A	5/19/1992	11/3/1994	$\mu g \cdot L^{-1}$
		E3303A	5/11/1995	to-date	$\mu g \cdot L^{-1}$
POTASSIUM	KKUR	0	7/19/1973	10/20/1981	$mg \cdot L^{-1}$
		002DA1	5/12/1982	6/25/1985	$mg \cdot L^{-1}$
		0905A1	7/22/1985	7/5/1988	$mg \cdot L^{-1}$
		002EA1	8/2/1988	11/3/1994	$mg \cdot L^{-1}$
	KKUT	E3249A	5/11/1995	to-date	$mg \cdot L^{-1}$
MAGNESIUM	MGUR	000B	7/19/1973	10/15/1980	$mg \cdot L^{-1}$
		0	2/2/1981	10/20/1981	$mg \cdot L^{-1}$
		001BA1	5/12/1982	6/25/1985	$mg \cdot L^{-1}$
		0901A1	7/22/1985	7/5/1988	$mg \cdot L^{-1}$
		001CA1	8/2/1988	11.3/1994	$mg \cdot L^{-1}$
	MGUT	E3249A	5/11/1995	to-date	$mg \cdot L^{-1}$

Table 4c cont'd Analytical Method Codes 1973 - 2006

Parameter	Code	Method	Start	End	Reported Units
MANGANESE	MNUT	000B	9/11/1973	10/15/1980	µg • L^{-1}
		0	2/2/1981	10/20/1981	µg • L^{-1}
		504AC2	5/12/1982	5/21/1985	µg • L^{-1}
		522AE2	6/25/1985	7/10/1089	µg • L^{-1}
		001AE5	8/81989	11/7/1991	µg • L^{-1}
		E3296A	5/19/1992	11/3/1994	µg • L^{-1}
		E3303A	5/11/1995	to-date	µg • L^{-1}
SODIUM	NAUR	0	7/19/1973	10/20/1981	mg • L^{-1}
		002DA1	5/12/1982	5/21/1985	mg • L^{-1}
		0905A1	7/22/1985	7/5/1988	mg • L^{-1}
		001EA1	8/2/1988	11/3/1994	mg • L^{-1}
	NAUT	E3249A	5/11/1995	to-date	mg • L^{-1}
NICKEL	NIUT	000A	6/26/1973	10/15/1980	µg • L^{-1}
		0	2/2/1981	10/20/1981	µg • L^{-1}
		522AA2	5/12/1982	11/3/1994	µg • L^{-1}
		E3080A	5/11/1995	8/20/1996	µg • L^{-1}
		E3386A	9/13/1996	to-date	µg • L^{-1}
NITROGEN;	NNHTFR	000B	7/19/1973	10/15/1980	µg • L^{-1}
+ AMMONIUM		0	2/2/1981	10/21/1985	µg • L^{-1}
		1524C2	11/19/1985	11/3/1994	µg • L^{-1}
	NNHTUR	E3374A	5/1/11995	to-date	µg • L^{-1}
NITROGEN;	NNOTFR	000B	6/26/1973	10/15/1980	µg • L^{-1}
NITRATE+NITRITE		0	2/2/1981	10/21/1985	µg • L^{-1}
		1525C2	11/19/1985	11/3/1994	µg • L^{-1}
	NNOTUR	E3374A	5/11/1995	to-date	µg • L^{-1}
NITROGEN;	NNTKFR	000A	5/10/1979	2/28/1980	µg • L^{-1}
TOTAL KJELDAHL	NNTKUR	000B	6/26/1973	10/15/1980	µg • L^{-1}
		0	2/2/1981	5/7/1984	µg • L^{-1}
		004AC2	6/4/1984	11/3/1994	µg • L^{-1}
		E3367A	5/11/1995	8/20/1997	µg • L^{-1}
		DTKN3424	2001	to-date	µg • L^{-1}

Table 4c: cont'd Analytical Method Codes 1973 - 2006

Parameter	Code	Method	Start	End	Reported Units
pH	PH	0	6/26/1973	10/21/1985	(H^+)
		0902PH	11/19/1985	11/3/1994	(H^+)
		E3042A	5/11/1995	to-date	(H^+)
TOTAL PHOSPHORUS	PPUT	000B	6/26/1973	10/15/1980	$\mu g \cdot L^{-1}$
		0	2/2/1981	10/21/1985	$\mu g \cdot L^{-1}$
		E3036A	5/11/1995	9/23/1997	$\mu g \cdot L^{-1}$
	PPUT1	5926C2	11/19/1985	3/13/1986	$\mu g \cdot L^{-1}$
		TP3036	3/13/1986	to-date	$\mu g \cdot L^{-1}$
SILICA;	SIO3UR	000E	7/19/1973	10/15/1980	$mg \cdot L^{-1}$
		0	2/2/1981	10/20/1981	$mg \cdot L^{-1}$
		001BC2	5/12/1982	3/13/1986	$mg \cdot L^{-1}$
		001BC1	4/7/1986	11/3/1994	$mg \cdot L^{-1}$
		E3370A	5/11/1995	8/20/1997	$mg \cdot L^{-1}$
		DORSCI3422	2001	to-date	$mg \cdot L^{-1}$
SULPHATE	SSO4UR	000B	6/23/1980	10/15/1980	$mg \cdot L^{-1}$
		0	2/2/1981	10/20/1981	$mg \cdot L^{-1}$
		003AI0	5/12/1982	11/3/1994	$mg \cdot L^{-1}$
		E3147A	5/11/1995	8/20/1997	$mg \cdot L^{-1}$
ZINC	ZNUT	000A	6/26/1973	10/15/1980	$\mu g \cdot L^{-1}$
		0	2/2/1981	10/20/1981	$\mu g \cdot L^{-1}$
		522AA2	5/12/1982	5/3/1983	$\mu g \cdot L^{-1}$
		0	6/1/1983	10/21/1985	$\mu g \cdot L^{-1}$
		001PP2	11/19/1985	12/12/1985	$\mu g \cdot L^{-1}$
	ZNUT	522AE2	1/15/1986	7/19/1993	$\mu g \cdot L^{-1}$
		005AF2	9/13/1993	9/13/1993	$\mu g \cdot L^{-1}$
		522AE2	10/28/1993	11/3/1994	$\mu g \cdot L^{-1}$
		E3080A	5/11/1995	8/20/1996	$\mu g \cdot L^{-1}$
		E3386A	9/13/1996	to-date	$\mu g \cdot L^{-1}$

4. THERMAL STRATIFICATION

4.1 Sampling protocol for chemistry with depth enforced limnetic layers

The principal method used by the Dorset Environmental Science Centre (DESC) to delineate the three thermal regimes of epilimnion, metalimnion and hypolimnion (1976 -89) involved graphing the temperature and drawing tangents through points of defined change (Wetzel 1975). This procedure did not insure that three limnetic layers would be sampled in lakes with depths less than 18 metres, owing to the relative instability of the three thermal zones (epilimnion, metalimnion and hypolimnion) in shallow lakes. The principal purpose of identifying the boundaries of these three limnetic layers is to obtain samples using the volume-weighted composite technique from within these layers. Lake specific volume- weighted composite sample proportions are presented in Appendix 3. Sampling protocols are for four lake depth ranges were selected based on repeated scenarios in trend through time data of temperature, dissolved oxygen, pH and dissolved inorganic carbon for all DESC study lakes (1976-90), that are presented in Girard and Reid (1991a-o).

4.2 Depth Enforced Limnetic Layers

The following protocol was used (1990 - 98) when the lake thermal stratification matched that of the Final Lake Stratification presented in Table 5. The individual lake sampling protocol numbers are presented in Table 6.

1a) *For <= 9 metre depth stratified lakes sampled at odd metre intervals of two metre strata*

Because shallow lakes have transient or unstable thermoclines, the classical division of the water column of a shallow lake into the three thermal zones typical of deep lakes (epilimnion, metalimnion and hypolimnion) was temporarily abandoned during the lake sampling years of 1990-1998. For sampling purposes however, the terms (here used within quotation marks) were retained in order to standardize the sampling of shallow lakes. The segregation of a lake's water column into sampling zones with discrete horizontal boundaries also permitted the quantification of significant chemical variables (e.g. dissolved oxygen in the "metalimnion" and hydrogen sulphide in the "hypolimnion") of even shallow lakes with very weak thermal gradients (Dillon et al. 1997). In early summer, a shallow lake of Zmax <= 9.0m, for example, had one "hypolimnetic" sample interval (6m-8m). Similarly, the "metalimnion" was arbitrarily identified as the zone between 4 and 6m, and the "epilimnion" was defined as the zone between 0 and 4m. Typically, as the summer season progressed, the water column of shallow lakes becomes homothermous from surface to bottom. From this point in

time, such lakes were sampled as "whole lake" samples with no special emphasis on horizontal zonation.

1b) *For <= 9 m depth stratified lakes sampled at mid point of one metre strata.*

Lakes of <= 9.0m depth were sampled for hypolimnetic chemistry at 5.5, 6.5 7.5m and potentially 8.5m. In every instance the epilimnion extended from surface to 5.0m by late July or early August, which subsequently requires the "metalimnetic" delineation of 4-5m, with the only sample point at 4.5 metres. This category has three lakes with Zmax of 7.0 to 8.9m of historical monitoring.

2) *For* >9.0m - <14.0m *depth stratified lakes sampled at odd metre intervals of two metre strata.*

Lakes of >9.0m - <14.0m were sampled for metalimnetic chemistry at 7m and hypolimnetic chemistry at 9, 11 and potentially 13m. The metalimnion is in strong evidence throughout the entire summer stratified period and is defined as the zone of greatest temperature change, with an enforced lower limit of 8.0 metres from the surface. This delineation lasts until fall cooling of the epilimnion penetrates this lower limit for the metalimnion. At this point the metalimnion should be retained as the single stratum (6-8m) and sampled at 7 metres.

3) *For* >= 14.0m - <18.0m *depth stratified lakes sampled at odd metre intervals of two metre strata.*

Lakes of >14.0m - <18.0m were sampled for metalimnetic chemistry at 9m and hypolimnetic chemistry at 11, 13, 15 and potentially 17 metres. Similar to protocol number 2, the metalimnion is defined as the zone of greatest temperature change below the epilimnion, but to a defined lower limit depth of 10m below surface. During fall cooling the epilimnion penetrates this latter lower limit of the metalimnion. Therefore until fall overturn the metalimnion is taken from a single strata (8-10m) and sampled at 9 metres.

4a) *For* >= 18.0m *depth stratified lakes sampled at odd metre intervals of two metre strata.*

Lakes of >18.0m were sampled for metalimnetic and hypolimnetic chemistry at intervals based on thermal stratification to one metre above bottom.

4b) *For* >= 18.0m *depth stratified lakes sampled initially at odd metre intervals to 11m and then discrete levels listed in Appendix 3 to one metre above bottom.*

Classic thermal stratification described in Hutchinson (1957) has been found to exist throughout the ice-free season for lakes listed in protocol 4a and 4b.

The (1999 - 2006) delineation of the three thermal regimes returned to the (1973-1989) methodology. The three thermal regimes of epilimnion, metalimnion and hypolimnion, involved graphing the temperature and drawing tangents through points of defined change (Wetzel 1975).

4.3 Thermal Energy Content of the routine study lakes:

Annual calculations of the thermal profiles of the routine "A" study lakes and the four primary Sudbury lakes (Clearwater, Lohi, Hannah & Middle) have identified the warmest observed date and temperatures throughout the ice-free season (1973 - 2003). A summary of these data for the primary Sudbury lakes is presented in Girard et al. (2006).

The calculations include:

Mean Temperature where: Sum of the (volume of strata / total volume) x strata temperature ^{o}C is expressed as degrees Celsius (^{o}C)

Summer Heat Content where: Sum of the (volume of strata x (^{o}C - 4.2) x 10^{6}) / lake surface area as $10^{4}m^{2}$ is expressed as calories per metre square (cal. m^{-2})

Summer Heat Income where: Sum of the (volume of strata x (^{o}C - 4.2) x 10^{6}) / lake volume as $10^{5}m^{3}$ is expressed as degrees Celsius (^{o}C)

Notably, Hutchinson (1957) and Wetzel (1975) utilized 4.0 ^{o}C as the ice-free lower limit to calculate increase in summer temperature, the Dorset Environmental Science Centre (Dr. P.J. Dillon 1973 - 1999) elected to use 4.2 ^{o}C as the ice-free lower limit.

Table 5: Trend through time lake stratification and sample protocol numbers (1990 – 1998)

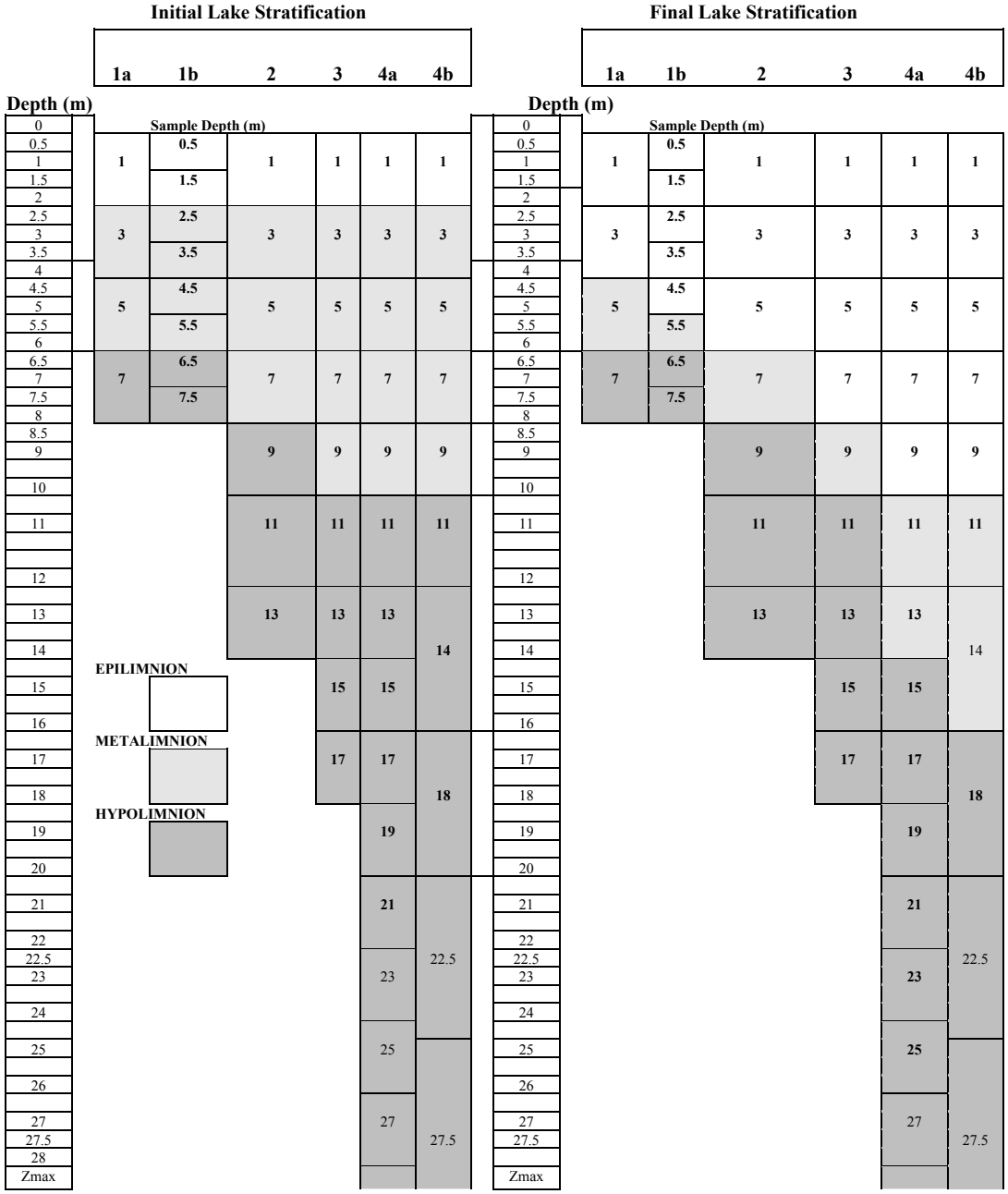


Table 6. Depth enforced limnetic layers (1990 - 1998)

Samples taken at odd metre interval for a two metre strata

LAKE	METALIMNION Sdepth (sample depth)	HYPOLIMNION Sdepth (sample depth)	ZMAX.	PROTOCOL No.
BAT	2(3)	4(5, 7)	8.3	1a
BRANDY	4(5)	6(7)	7.5	1a
FAWN	4(5)	6(7)	7.9	1a
HAMER	4(5)	6(7)	8.5	1a
LOUCK'S	4(5)	6(7)	8.2	1a
PEARCELEY	4(5)	6(7)	8.1	1a
SKIDWAY	4(5)	6(7)	7.8	1a
DICKIE	6(7)	8(9,11)	12.0	2
LEECH	6(7)	8(9,11,13)	13.7	2
CLARA	6(7)	8(9)	11.0	2
DRUMMER	6(7)	8(9)	10.2	2
GULLFEATHER	6(7)	8(9, 11)	13.0	2
LITTLE WHETSTONE	6(7)	8(9,11, 13)	13.6	2
RANGER	6(7)	8(9,11)	13.0	2
SHOELACE	6(7)	8(9,11)	12.0	2
WINDFALL	6(7)	8(9,11, 13)	13.8	2
PINCHER	8(9)	10(11, 13, 15)	15.5	3
PLASTIC	8(9)	10(11, 13, 15)	16.3	3
GLEN	8(9)	10(11, 13)	15.0	3
LEONARD	8(9)	10(11, 13)	15.2	3
WALKER	8(9)	10(11, 13, 15)	17.0	3
CRYSTAL	8(9)	10(11, 13, 15)	17.1	3
HENEY	(Usually a 5.8m Zmax. and a whole lake sample)			N/A
ROUND	(Usually a 9.0m Zmax. and a whole lake sample)			N/A
SUNSET	(Usually a 6.5m Zmax. and a whole lake sample)			N/A
	Samples taken at mid point of one metre strata			
HEALEY	4(4.5)	5(5.5, 6.5)	7.0	1b
MOOT	4(4.5)	5(5.5, 6.5)	7.9	1b
MOUSE	4(4.5)	5(5.5, 6.5,7.5, 8.0)	9.0	1b

Samples taken at interval >= 18m depth 4a, 4b

THERMAL STRATIFICATION

Protocol No. 4a	Protocol No. 4a	4b	WHOLE LAKE SAMPLES
BASSHAUNT	MAGGIE	CINDER EAST	CLEARWATER
BIG PORCUPINE	McKAY	CROWN	HANNAH
BIGWIND	NUNIKANI	KIMBALL	HENEY
BLUE CHALK	PENNINSULA	LOUISA	LOHI
BONNECHERE	POKER EAST	NELSON	MIDDLE
BUCK	RED PINE	SHERBORNE	ROUND
CHUB	RED CHALK MAIN	SMOKE	SUNSET
CINDER WEST	SOLITAIRE	WESTWARD	
CLEAR	TIMBERWOLF		
CRADLE	VERNON		
CROSSON	YOUNG		
DELANO	JOSEPH		
HARP	MUSKOKA		
JERRY	ROSSEAU		
JOE	LAKE OF BAYS		
LITTLE CLEAR			

5. LAKE MORPHOMETRY

Morphometric data are summarized for all study lakes in Table 7b. Revisions for sub-basins of multiple basin study lakes previously reported in Girard and Reid (1990a) are presented in Table 8. The revisions are based on a broader protocol which includes sectors of navigable water surface areas previously omitted in earlier study objectives. Complete morphometric summaries for sub-basins of lakes Muskoka, Rosseau and Joseph are presented in Table 8. and "The Limnology of the Muskoka Lakes" (available on CD).

Bathymetric maps and morphometric data are presented in Appendix 1. A summary of the lake area, mean and maximum depth for all previously studied lakes is provided in Table 7b. Additionally, the watershed and subwatershed areas (10^4 m^2) for the Lakeshore Capacity Study lakes are presented in Table 7b. The morphometry and catchment areas presented here for the calibrated watersheds were revised in Reid et al. (1987) from those previously reported in Scheider et al. (1983a), Nicolls et al. (1983) and Girard et al. (1985). Bathymetric maps were drawn at 2m contour intervals from sonar transects taken with a Furuno Mark III echo-sounder (Locke 1985). From 1986 to 2003, Lowrance X16 computer sonar equipment with an 8 degree cone transducer was used. All contour maps were produced using the proportional divider technique described in Dodge et al. (1987).

The deep station sampling sites for chemistry, phytoplankton and zooplankton, as well as the littoral zone benthic macroinvertebrate (KS#) and crayfish sites (C#) are indicated on the bathymetric maps presented in Appendix 1.

5.1 Morphometric parameters

Morphometric parameters were calculated using Hutchinson (1957) and were originally presented in Nicolls et al. (1983). The morphometric parameters include the following:

1) Area (A_O) as lake surface area (ac) or (ha) with conversion acres / 0.4047 = hectares and 1 km^2 = 100 ha.

2) Volume (V) as total lake volume calculated by summing the individual stratum volumes determined as noted below (e.g. 131.617 volume x 10^4 m^3 per example page 36). The inverse calculation from mean depth will also calculate volume as A_0 x mean depth = volume x 10^4

3) Mean Depth calculated as V/A_O (e.g. 131.617 x 10^4 / 30.35, per example page 36) = 4.34 m mean depth. Volume must be (x 10^4) and area as (hectares) in order that the calculation equals mean metres.

4) Maximum Depth (Z_m) = as (ft) or (m) with conversion feet x 0.3048 = metres.

5) Shoreline Length (L) as total length expressed as (mi) or (km) with conversion miles x 1.6 = kilometres

6) Development of Shoreline (D_L) as the ratio (dimensionless) of the shoreline length to the length of the circumference of a circle of equal area to that of the lake.

$D_L = L / \{ 2 * SQRT \{ \pi * Ao \} \}$

where: L = shoreline in km (lake perimeter, disregard islands)

Ao = area in square km (km^2)

π = 3.14

Therefore D_L = (km)/(2*(SQRT (3.14*(ha/100)))) as a Microsoft Excel formula.

D_L must be >1 and is a measure of the irregularity of the shoreline.

7) Development of Volume (D_V) The ratio of the volume of the lake to that of a cone of basal area A_0 and height Z_m

D_V = 3 x mean depth / maximum depth Z_m

This quantity is an expression of the form of the lake basin.

8) Contour Area (a_1) The surface area within each of the depth contours. These contour areas are used to calculate strata volume and are sequentially numbered A_1, A_2,.. A_n.

9) Stratum Volume - The volume of a lake stratum between two contour depths:

<u>as a Microsoft Excel formula</u>

Stratum Volume = $(h_1/3 * (a_1 + a_2 + (sqrt\ (a_1 * a_2)))$ =(2/3*(30.35+22.99+(sqrt(30.35*22.99)))

where h_1 = the contour stratum depth (i.e. 2m) = 53.17 x 10^4 m^3

a_1 = the upper contour area (i.e. 30.35 hectares)

a_2 = the lower contour area (i.e. 22.99 hectares)

Hence Total lake volume = $(h_1/3 * (a_1 + a_2 + (sqrt\ (a_1 * a_2))) + (h_2/3 * (a_2 + a_3 + (sqrt\ (a_2 * a_3))) + n$

where h_2 = the second contour interval (i.e. 2 m)

a_2 = the stratum top contour area (i.e. 22.99 hectares)

a_3 = the stratum bottom contour area (i.e. 15.64 hectares)

The transcribing of depths from echo sounding tapes was performed using the Proportional Divider technique described in Chapter 8 of Dodge et al.(1987). The lake morphometry method utilized throughout the DESC lake studies consistently followed the approach presented in: Dodge et

al. (1987). Additional techniques were employed in the event that existing Ministry of Natural Resources historical lake morphometry information was used. These techniques included the following conversions and interpolations. The purpose of the interpolations was to define the uniform depth interval and relative stratum areas for the calculation of stratum volumes which were in turn utilized in the volume-weighted composite of water sample collection technique.

Measurement Conversion Factors: <u>feet to metres</u> (ft X 0.3048 = m),
<u>acres to hectares</u> (ac X 0.4047 = ha)

Depth and stratum area interpolation:(four known area values were surface, 20ft, 30ft & Z_m34ft)

Interval Count	Depth (m)	Area (ha)	Interpolation interval fraction	Area (ha)	Stratum Volume (x 10^4 m^3)
	0	**30.35**	= (30.35-8.28)/6	**30.35**	
1	1	26.67	= 3.678	30.35- 3.678 = 26.67	53.170
2	2	**22.99**		26.67- 3.678 = **22.99**	
3	3	19.32		22.99- 3.678 = 19.32	38.395
4	4	**15.64**		19.32- 3.678 = **15.64**	
5	5	11.96		15.64- 3.678 = 11.96	23.533
6	6.1	**8.28**	=(8.28-2.39)/3	11.96- 3.678 = **8.28** confirmed interpolation	
1	7	6.32	= 1.96	8.28- 1.96 = 6.32	12.421
2	8	**4.35**		6.32- 1.96 = **4.35**	
3	9.14	2.39	confirmed interpolation	4.45- 1.96 = 2.39	4.098
	10	0.49	=(2.39-0)/(10.36-9.14)	2.39- 1.96 = **0.43**	
	10.36	<u>0</u>	= 1.96	0 <u>Total Volume 131.617 x 10^4 m^3</u>	

A total lake volume may now be performed as a composite of 2 metre strata (A_1 =30.35 to A_2=22.99), (A_2=22.99 to A_3=15.64), (A_3=15.64 to A_4=8.28) etc. where volume is report as (volume x 10^4 m^3). The 2 metre depth stratum accommodates the odd metre interval sample points utilized in the standard DESC volume-weighted composite technique. Sample volume is simply calculated as: (stratum volume / total volume) x (required total sample volume ie. 3000 ml)

i.e, (stratum A_1 to A_2 = 53.17) / (total vol. 131.617) x 3000ml = 1212 ml @ 1m sample depth

(stratum A_2 to A_3 = 38.40) / total vol. 131.617) x 3000ml = 875 ml @ 3m sample depth

(stratum A_3 to A_4 = 23.53 / total vol. 131.617) x 3000ml = 536 ml @ 5m sample depth etc.

The following method is the standard procedure for calculating "Ice – Free" (IE) annual mean chemical concentrations. This procedure involves calculating the sum of the values derived from the spring whole lake to the fall whole lake samples and includes the volume weighting technique upon each of the thermally stratified epilimnion, metalimnion and hypolimnion throughout the summer stratified period. The specific proportion of each of the limnetic layers is determined proportionally to the total lake volume for each of the sample dates. That proportional fraction is multiplied by the sample date chemical concentrations in order to develop a combined value from the sum of the three fractioned layers.

Example: performed in an Excel spreadsheet format.

Blue Chalk Lake

STN	SDATE	SUBNUM	STN	SDATE	WLAYER	WDEPTH	SDEPTH	BGDEPTH	Volume		ALKT
BC	5/5/2003	C104587	BC W	5/5/2003	1	21.4	0.0	21.4	44.68		8.4
BC	6/17/2003	C106174	BC EPI	6/17/2003	2	21.0	0.0	4.0	17.25		6.4
BC	6/17/2003	C106174	BC META	6/17/2003	3	21.0	4.0	8.0	12.29		6.45
BC	6/17/2003	C106174	BC HYPO	6/17/2003	4	21.0	8.0	21.0	15.13	44.68	6.6

The May 5th ALKT. mg • L^{-1} $CaCO_3$ is a whole lake composite volume weighted sample concentration which does not require further manipulation. The next sample requires three independent calculations to proportionate the three layers (epilimnion, metalimnion & hypolimnion) into a single whole lake value. The volume of the individual limnetic layers is determined from the data provided in App. 1 page 7 Blue Chalk Lake strata volume

= ((17.25 x 6.4) + (12.29 x 6.45) + (15.13 x 6.6)) / 44.68

The sum of the three calculations is divided by the total lake volume (44.68) to calculate the whole lake concentration = 6.48 mg • L^{-1} $CaCO_3$

Typically the annual reported IE values are presented as Mean, N, Maximum Minimum, and STDEV. values.

5.2 Hydrological data calculations for the study lake water balance analysis

Lake Flushing Time or replenishment time is calculated as:

Lake volume (10^4 x m^3) / lake outflow (10^4 x $m^3 \cdot yr^{-1}$)

where lake outflow is the sum of known daily flow ($L \cdot sec^{-1}$) x 86,400 = ($L \cdot day^{-1}$) from June 1 of year one to May 31 of year two. Note: June 1 to May 31 is the standard hydrologic year.

Lake Level (Storage) is the deviation of annual lake levels ($m \cdot yr^{-1}$)

May 31 yr 2 lake staff gauge (m) – June 1 yr 1 lake staff gauge (m) x lake area (10^4 m^2)

= 10^4 $m^3 \cdot yr^{-1}$

Change in lake level is entered as a loss, but can be positive or negative, depending upon whether water is added or removed over the time period for which the balance is performed.

Lake Evaporation is defined as a loss term in the water balance of a lake:

Lake area (10^4 m^2) x the estimated evaporation rate ($m \cdot day^{-1}$) = 10^4 $m^3 \cdot yr^{-1}$

where estimated evaporation rate techniques have evolved through Scheider et al (1983a), Locke and deGrosbois (1986; after Barry and Robertson [1975]), and Scott et al. (2005). The latter technique is defined as a climatologically based model (Morton 1979). The model requires elevation in metres above sea level (mASL), latitude, longitude, temperature, relative humidity, solar radiation, vapor pressure and dew point temperature data.

Residence Time is the length of time required to displace a volume of water equivalent to the lake volume. The term is calculated as:

Lake volume (10^4 x m^3)/ total annual loss of water from the lake (10^4 x $m^3 \cdot yr^{-1}$). The total annual loss of water from the lake is the sum of the lake discharge (10^4 x $m^3 \cdot yr^{-1}$) plus evaporation (10^4 x $m^3 \cdot yr^{-1}$) and lake storage (10^4 x $m^3 \cdot yr^{-1}$).

5.3 Areal Units and associated calculations

Table 7b presents physical characteristics of the DESC study lakes and lake specific watershed and subwatershed areas (10^4 x m^2) for the core lakes (Reid et al. 1987; Girard and Nicolls 1987; updated in 1990 and 2006). Note that area in hectares and 10^4 x m^2 are equivalent. Historical use of these data includes the calculation of atmospheric deposition, which subsequently allows for the calculation of atmospheric loads of chemical variables reported in precipitation. Similarly, the tributary runoff and subsequent chemical loading is derived from distinguishing the gauged watershed area and prorating

flow to include the ungauged area and subsequently calculating the tributary loads based on the tributary chemistry. Historical DESC hydrologic references include Scheider et al. (1983a, 1983b), Locke and Scott (1986), Hutchinson et al. (1994a) and Hutchinson et al. (1994b). The meteorological database is described in Locke and de Grosbois (1986). The hydrology, meteorology and subsequent water balance and chemical load calculations for the Lake Simcoe watershed are described in Scott et al. (2001, 2006) for the years 1990 to 2004. The calculations described herein are those which incorporate Table 7b values.

Atmospheric deposition is based a hydrologic year running from June 1 of year one to May 31 of year two, where metres (m) precip x lake area (m^2) e.g. 542.04 x 10^4 = m^3 precipitation

Atmospheric loads are volume of precip (m^3) x concentration $\mu g \bullet L^{-1}$ = load, where:

((m^3) * 1000) = litres deposition x $\mu g \bullet L^{-1}$ / 10^9 = kg load per unit date interval.

Tributary loads are also based a hydrologic year from June 1 of year one to May 31 of year two where daily flow is measured as $L \bullet sec^{-1}$and interpolated to $L \bullet day^{-1}$($L \bullet sec^{-1}$ x 86,400 = $L \bullet day^{-1}$).

Unmeasured terrestrial runoff is a calculation based on the assumption that the annual runoff from the ungauged sub-catchment areas will respond to atmospheric inputs in a similar manner to that of the gauged sub-catchments within the same drainage basin. Therefore unmeasured terrestrial runoff is calculated as the sum of the measured inflows (m^3) divided by the sum of the gauged watershed areas (m^2) and then multiplied by the area of the ungauged component (m^2).

Tributary chemical concentration files are based on individual sample dates (point to point). The chemical loads are calculated using flow (hydrology) where a known volume of water is measured between chemistry sample dates and the chemical concentration is applied to that volume. The following calculation demonstrates the technique utilized to interpolate chemical loads across an odd number of days between sample dates.

Date	Discharge ($L \bullet day^{-1}$)	concentration ($\mu g \bullet L^{-1}$)
1- Aug-2000	755	60 previous sample date reported value 60 ($\mu g \bullet L^{-1}$)
2-Aug-2000	923	60
3-Aug-2000	848	60
4-Aug-2000	722	75
mid point interpolation mean 75 where number of days between sample dates are known		
5-Aug-2000	656	90
6-Aug-2000	555	90
7-Aug-2000	867	90 next sample date reported value 90 ($\mu g \bullet L^{-1}$)

Daily Loads = L • day $^{-1}$ x μg • L^{-1} concentration / 1 x 10^9 = kg • date^{-1}

Monthly Loads = (kg • mo^{-1}) = sum of the daily loads per month

Annual load is the sum of the monthly loads between June 1st of year one to May 31st of year two.

Additional usage of the areal units presented in Table 7b includes the following:

Annual areal runoff for a gauged watershed is the sum of the annual discharge (m^3 • yr^{-1}) / gauged watershed area (m^2) = (m • yr $^{-1}$). Purpose: Expressing monthly discharge as annual unit areal runoff factors out sub-catchment area and facilitates the comparison of monthly discharge between sub-catchments.

Annual Yield for a gauged watershed is calculated as:

annual discharge (m^3 • yr^{-1} / gauged watershed area (m^2) = annual areal unit runoff (m • yr^{-1})

divided by Precip depth (m • yr^{-1}) or annual areal runoff (m • yr^{-1}) / precip depth (m • yr^{-1})

Sub-watershed tributary unit areal yield is the fraction of the annual precipitation which is lost from the sub-catchment as stream flow.

Notably: Total Phosphorus is reported in μg • day^{-1} and is directly calculated to load as follow:

L • day^{-1} x μg • L^{-1} concentration / 1 x 10^9 = kg • date^{-1}

(all DESC load programs are set up to deal with μg • L^{-1})

Note: kg • yr $^{-1}$ / 1000 = load in metric tons

6. LAKE STATION LOCATION, ABBREVIATION AND IDENTIFICATION CODES

The DESC database has two unique tables that present information describing all recorded lakes and their associated station locations. The first is the Geographic_mgr_Body_of_Water table which provides a unique lake code (number) for all reported bodies of water as well as latitude, longitude, elevation, topographic map number at scale of 1:50,000, Ontario Watershed Unit (Cox 1976) and main chemical station codes. These data are summarized in Table 7a. The second table (Geographic_mgr_Stations) hosts all reported station locations associated with recorded bodies of water. This latter table includes station locations for several study components within the individual lake watershed. These include: terrestrial (biogeochemistry), meteorological (precipitation, wind speed, wind direction, relative humidity and temperature), hydrologic and associated chemistry, biological collection (benthic macroinvertebrates, stream macroinvertebrates, littoral zone crayfish, mid lake zooplanktion and phytoplankton), and mid lake single or multiple basin water chemistry sites. The tables share the index key of the Body_of_Water "code" for each specified lake. Physical data and acid sensitivity indices (Ontario Ministry of the Environment 1989) for each lake are summarized in Table 7b. Different sample collection methods have necessitated multiple station ID codes for the same body of water. However, distinct Body_of_Water codes exist in the database to allow the retrieval of all data (i.e. all stations) collected for a unique body of water. For example, the chemistry data from Clearwater Lake (originally studied by the Extensive Monitoring Programme of the Sudbury Environmental Study and later by the DESC) would require two station ID codes- 96016598501 and 14003550001. Both of these codes and any others that exist for Clearwater Lake could be accessed using the single Body of Water code (646) for Clearwater Lake. The DESC Body of Water code numbers are neither correlated nor cross referenced with the larger Ontario Inland Lakes Database of more than 7,000 lakes. The common denominator to these two database systems is the inclusion of the host township and secondarily the location latitude and longitude. The list of station ID codes in Table 7a includes the most commonly used station IDs. The summary of lakes listed in Table 7a and 7b include lakes from unpublished studies. These include studies both biological and chemical in scope and are best described as survey studies that provided details pertaining to regional differences in parameter distribution and abundance or concentration. The distinction of these studies may be found within the station abbreviation or the station identification codes. Lake abbreviations listed for a phosphorus study are denoted as P# and were collected as a

surface grab sample. Similarly abbreviations listed as H# were a group of lakes in which Mercury (Hg) analysis was the focus.

The Inland Lake Studies (1986 - 1995), multiple basin study lakes station descriptions and their associated areas are presented in Table 8, to include the missing sector and corrected navigable river areas unreported in Girard et al. (1990). For the multiple basin study lakes station location descriptions were obtained from navigation charts at a scale of 1:12,000 (Table 9). Lake abbreviations listed as IB, IG, IJ, IM, and IR were from an inland lake multiple basin study previously described in Table 2a. Similarly, the Rice and Sturgeon Lakes Nutrient Budget Study (1986 -89) utilized both multiple stream and lake sites (Hutchinson et al. 1994e).

In the event that two station codes are listed, the station abbreviation and identification codes differentiate the studies listed herein (e.g. Nunikani P15 station code 9810061501 and NI station code 17002155101). The last units of zero and one denote a lake chemical sampling station. In instances where the station code ends with a zero and a number two, the code describes associated streams of the primary ("A") set of study lakes described in Hutchinson et al. (1994a) as the hydrology data for the lakes and catchments in Muskoka/Haliburton (1980 -92). An earlier data report (Scheider et al. 1983) presented data from the first four years of the study (1976 -80).

The location of the major catchments presented in Table 7a were first reported in Hutchinson et.al.1994a.

Table 7a. Location of the DESC study lakes including Station ID codes

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
284 AXE	45° 23”	79° 30”	31E/5, 6	2EB13	Parry Sound-Muskoka	Monteith	**AX**	03008563001, 999ERC00020
240 ARMISHAW	45° 14”	79° 46”	31E/4	2EB07	Parry Sound	Humphrey		99ERC00042
843 ARROWHEAD	45° 24”	79° 12”	31E/6	2EB15	Muskoka	Chaffey	**AH**	99999AH0101
58 ART (SPRUCE)	45° 03”	78° 27”	31E/1	2HF09	Haliburton	Dysart	**P58**	98010065801
173 AVERY	45° 12”	78° 49”	31E/2	2HF08	Haliburton	Sherborne	**P2-18**	99994797002
265 BACK	45° 18”	79° 55”	31E/5	2EA14	Parry Sound	Foley		9999ASS1530
8 BALSAM	44° 35”	78° 50”	31D/10	2HF02	Victoria	Bexley,Fenlon, Somerville	**BM**	999BIO00101
59 BASSHAUNT	45° 07”	78° 28”	31E/1	2HF10	Haliburton	Guilford	**BH**	17002152001
72 BAT	45° 35”	78° 31”	31E/10	2KD20	Nipissing	Canisbay	**S1, (BT)**	98020010101
126 BAT	45° 09”	78° 38”	31E/2	2HF10	Haliburton	Dysart et al (Guilford)	**P20**	98010062001
455 BAT	45° 33”	80° 00”	41H/9	2EA13	Parry Sound	Ferguson		9999ASS1592
1032 BEAR	45° 20”	78° 42”	31E/7	2EB12	Haliburton	Livingston		99994796403, 999ERC00339
266 BEAR	45° 26”	79° 35”	31E/5	2EA14	Parry Sound	Monteith		9999ASS1607
127 BEECH	45° 05”	78° 42”	31E/2	2HF10	Haliburton	Stanhope	**P49**	98010064901
128 BEECH R.(BAKER)	45° 03”	78° 43”	31E/2	2HF10	Haliburton	Stanhope	**BE1**	17002150502
110 BELL'S(SILVER)	45° 36”	79° 41”	31E/12	2EA10	Parry Sound	Spence		9999ASS1647
575 BELL	46° 07”	81° 12”	41I/3	2CF03	Sudbury	Groschen		96016597701
453 BELL (BELL'S)	45° 25”	80° 01”	41H/8,7	2EA14	Parry Sound	McDougall		9999ASS1641
129 BENTSHOE	45° 02”	79° 56”	31E/2	2EC15	Haliburton	Hindon		9999ASS1655
6756 BIG BROTHER	45° 11”	78° 48”	31E/2	2HF08	Haliburton	Stanhope	**P33**	98010063301
424 BIG ORILLIA	45° 06”	79° 00”	31E/2, 3	2EC15	Haliburton	Hindon		9999ASS7486
310 BIG PORCUPINE	45° 27”	78° 37”	31E/7	2EB11	Haliburton	Lawrence-Livingston	**BP**	03008564001, 999ERC00231
132 BIG EAST	45° 02”	79° 57”	31E/2	2EC15	Haliburton	Hindon		9999ASS1685
133 BIG HAWK	45° 09”	78° 45”	31E/2	2HF08	Haliburton	Stanhope	**P30**	98010063001
211 BIGWIND	45° 03”	79° 03”	31E/3	2EB09	Muskoka	Oakley	**BW**	03008550001, 999ERC00170
212 BIRD	45° 02”	79° 04”	31E/3	2EB09	Muskoka	Oakley		9999ASS1724, 999ERC00171
286 BITTERN	45° 26”	79° 18”	31E/6	2EB13	Parry Sound	Perry		98030050102, 999ERC00233
456 BLACK	45° 38”	80° 10”	41H/9	2EA11	Parry Sound	Burton		9999ASS1740
134 BLUE CHALK	45° 12”	78° 56”	31E/2	2EC15	Muskoka	Ridout	**BC**	03007754001
134 BLUE CHALK R.#1	45° 12”	78° 56”	31E/2	2EC15	Muskoka	Ridout	**BC1**	03007754102

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
134 BLUE CHALK ØF.	45° 11"	78° 56"	31E/2	2EC15	Muskoka	Ridout	**BCØF**	03007754002
21 BOB	44° 55"	78° 47"	31D/15	2HF10	Haliburton	Anson,Hindon,Minden		96014599501
752 BOWLAND	47° 05"	80° 50"	41P/2	2DC01	Sudbury	Howey	**STN 1**	96016594801
311 BONNECHERE	45° 28"	78° 35"	31E/7	2KD01	Haliburton	Lawrence	**BO**	18349055101
135 BOSHKUNG	45° 04"	78° 44"	31E/2	2HF10	Haliburton	Stanhope	**P40**	98010064001
241 BRANDY	45° 06"	79° 31"	31E/4	2EB04	Muskoka	Watt-Monck	**BY**	03008563101, 999ERC00173
241 BRANDY WEST	45° 06"	79° 31"	31E/4	2EB04	Muskoka	Watt-Monck	**BY - W**	03008564101
241 BRANDY STREAM 1	45° 06"	79° 31"	31E/4	2EB04	Muskoka	Watt-Monck	ILBYC1	999BYC00102
241 BRANDY STREAM 2	45° 06"	79° 31"	31E/3	2EB04	Muskoka	Watt-Monck	ILBYC2	999BYC00202
241 BRANDY STREAM 3	45° 06"	79° 31"	31E/3	2EB04	Muskoka	Watt-Monck	ILBYC3	999BYC00302
241 BRANDY STREAM 4	45° 06"	79° 31"	31E/3	2EB04	Muskoka	Watt-Monck	ILBYC4	999BYC00402
241 BRANDY STREAM 5	45° 06"	79° 31"	31E/3	2EB04	Muskoka	Watt-Monck	ILBYC5	999BYC00502
241 BRANDY STREAM 6	45° 06"	79° 31"	31E/3	2EB04	Muskoka	Watt-Monck	ILBYC6	999BYC00602
241 BRANDY STREAM 7	45° 06"	79° 31"	31E/4	2EB04	Muskoka	Watt-Monck	ILBYC7	999BYC00702
241 BRANDY STREAM 8	45° 06"	79° 31"	31E/4	2EB04	Muskoka	Watt-Monck	ILBYC8	999BYC00802
312 BUCK	45° 23"	79° 00"	31E/7	2EB10	Muskoka	Sinclair	**BK**	03008554001, 999ERC00090
287 BUCK	45° 25"	79° 23"	31E/6	2EB13	Parry Sound/Muskoka	McMurrich-Stisted	**H6**	98030060101
45 BUCKHORN	44° 29"	78° 23"	31D/8	2HH02	Peterborough	Victoria et al		999BIO00801
267 BURNSIDE	45° 25"	79° 31"	31E/5	2EB13	Parry Sound/Muskoka	McMurrich		999ERC00238
672 CAMP	46° 22"	81° 00"	41I/7	2DB01	Sudbury	Broder		
22 CANNING	44° 56"	78° 38"	31D/15	2HF09	Haliburton	Minden-Snowdon	**P57**	98010065701
582 CARLYLE	46° 04"	81° 17"	41I/3	2CF03	Manitoulin	Carlyle		96013598702
136 CAT	45° 10"	78° 41"	31E/2	2HF08	Haliburton	Stanhope	**P18**	98010061801
119 CHEER	45° 47"	79° 30"	31E/13	2EA20	Parry Sound	Chapman-Strong		9999ASS2031
46 CHEMONG	44° 24"	78° 23"	31D/8	2HH02	Peterborough,	Victoria, Ennismore		999BIO00901
137 CHUB	45° 13"	78° 59"	31E/2	2EB09	Muskoka	Ridout	**CB**	03008553001
137 CHUB R. #1	45° 13"	78° 59"	31E/2	2EB09	Muskoka	Ridout	**CB1**	03008553102
137 CHUB R. #2	45° 13"	78° 59"	31E/2	2EB09	Muskoka	Ridout	**CB2**	03008553202
137 CHUB R. ØF	45° 13"	78° 59"	31E/2	2EB09	Muskoka	Ridout	**CBØF**	03008553002
139 CINDER	45° 13"	78° 59"	31E/2	2EC15	Haliburton	Hindon	**CI**	03007751601
138 CINDER EAST	45° 04"	78° 56"	31E/2	2EC15	Haliburton	Hindon	**CIE**	03007751701
93 CLAM (BIG CLAM)	45° 32"	79° 09"	31E/11	2EA22	Muskoka	Bethune		9999ASS6191

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
75 CLARA	45° 33"	78° 52"	31E/10	2EB13	Nipissing	McCraney	**S4, (CA)**	98020040101, 999ERC00241
675 CLARA BELLE	46° 29"	81° 06"	41I/6	2CF07	Sudbury	Snider		
140 CLAYPACK	45° 08"	78° 38"	31E/2	2HF11	Haliburton	Dysart et al (Guilford)	**P21**	98010062101
313 CLAYTON	45° 21"	78° 45"	31E/7	2EB12	Muskoka	Livingston	**CY**	99994795901, 999BIO01101
141 CLEAN	45° 15"	78° 32"	31E/2	2HF11	Haliburton	Dysart et al (Havelock)		9999ASS2067
142 CLEAR	45° 11"	78° 43"	31E/2	2HF08	Haliburton	Sherborne	**P19, CL**	98010061701, 17002153001
214 CLEAR	45° 02"	79° 01"	31E/3	2EC15	Muskoka	Oakley		9999ASS2068
676 CLEARWATER	46° 22"	81° 03"	41I/6	2CF05	Sudbury	Tilton-Broder	**CR**	14003550001, 96016598501
403 CLYDE	45° 18"	78° 16"	31E/8	2KD02	Haliburton	Clyde	**CE**	9999ASS2100
245 CODE	45° 11"	79° 52"	31E/4	2EB02	Parry Sound	Conger		999RAR00001
288 COMPASS	45° 29"	79° 23"	31E/6	2EB13	Parry Sound	McMurrich-Perry		999ERC00018
408 COSTELLO CREEK	45° 38"	78° 21"	31E/9	2KD10	Nipissing	Sproule		MULTI STN.Chmielewski 1992
314 CRADLE	45° 28"	78° 35"	31E/7	2KD18	Haliburton	Lawrence	**S2, (CR)**	98020020101
143 CRANBERRY	45° 07"	78° 32"	31E/2	2HF10	Haliburton	Dysart et al (Guilford)	**P24**	98010062401
111 CRAWFORD (OTTER)	45° 36"	79° 45"	31E/12	2EA10	Parry Sound	Croft		9999479620, 9999ASS2171
215 CROSSON	45° 05"	79° 02"	31E/3	2EC15	Muskoka	Oakley	**CN**	03007751001
215 CROSSON R. #1	45° 05"	79° 02"	31E/3	2EC15	Muskoka	Oakley	**CN1**	03007751102
215 CROSSON R. ØF	45° 05"	79° 02"	31E/3	2EC15	Muskoka	Oakley	**CNØF**	03007751002
702 CROWLEY	46° 23"	80° 59"	41I/7	2DB01	Sudbury	Broder		
315 CROWN	45° 26"	78° 40"	31E/7	2EB11	Haliburton	Livingston	**CW**	03008563901, 999ERC00247
409 CRYSTAL	45° 23"	78° 29"	31E/8	2KD18	Haliburton	Lawrence	**S3, (CY)**	98020030101
702 DAISY	46° 27"	80° 54"	41I/7	2CF05	Sudbury	Neelon & Dill		96016594001
7453 DAWSON POND	45° 10"	78° 50"	31E/2	2HF10	Haliburton	Sherborne	**(P2-5)**	99994796899
268 DEAVY	45° 22"	79° 34"	31E/5	2EA19	Parry Sound	Monteith	**DV**	9999ASS2259
76 DELANO	45° 31"	78° 36"	31E/10	2KD01	Nipissing	Canisbay	**DO**	18349055001
1655 DEVINE	45° 12"	79° 14"	31E/3	2EB14	Muskoka	Stephenson	DEV	9999ASS2288, 99DMM002201
5471 DICKEY	44° 47"	77° 44"	31C/13	2HK10	Hastings	Lake		9999ASS6264, 999BIO01401
217 DICKIE	45° 09"	79° 05"	31E/3	2EB09	Muskoka	McLean	**DE**	03008551001, 999ERC00249
217 DICKIE R. #5	45° 09"	79° 05"	31E/3	2EB09	Muskoka	McLean	**DE5**	03008551502
217 DICKIE R. #6	45° 09"	79° 05"	31E/3	2EB09	Muskoka	McLean	**DE6**	03008551602
217 DICKIE R. #8	45° 09"	79° 05"	31E/3	2EB09	Muskoka	McLean	**DE8**	03008551802
217 DICKIE R. #10	45° 09"	79° 05"	31E/3	2EB09	Muskoka	McLean	**DE10**	03008552002

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
217 DICKIE R. #11	45° 09"	79° 05"	31E/3	2EB09	Muskoka	McLean	**DE11**	03008552102
217 DICKIE R. ØF	45° 09"	79° 05"	31E/3	2EB09	Muskoka	McLean	**DEØF**	03008551002
316 DOUGHNUT	45° 28"	78° 54"	31E/7	2EB15	Nipissing	Findlayson	**DT**	9999ASS2335
494 DOWNES	46° 44"	81° 35"	41I/12	2CF10	Sudbury	Moncrieff		9999ASS6278
60 DRAG	45° 05"	78° 24"	31E/1	2HF09	Haliburton	Dudleu-Dysart	**P51**	98010065101
77 DRUMMER	45° 32"	78° 45"	31E/10	2EB11	Nipissing	Peck	**S5, (DR)**	98020050101, 9999ASS2346
6721 DUCK	44° 40"	78° 58"	31D/10	2EC13	Victoria	Laxton		99994797402
209 DUCK	45° 00"	78° 39"	31E/2,D/15	2HF08	Haliburton	Anson, Hindon, Minden	**P43**	98010064301
209 DUCK INFLOW #1	45° 00"	78° 39"	as above		Haliburton	Anson, Hindon, Minden	**DK1**	17002150101
210 EAGLE	45° 08"	78° 31"	31E/1,2	2HF10	Haliburton	Dysart et al (Guilford)	**P5**	98010060501
218 ECHO	45° 11"	79° 04"	31E/3	2EB09	Muskoka	McLean		9999ASS2401, 999ERC00060
401 EYRE (BLACK)	45° 16"	78° 30"	31E/7,8	2HF11	Haliburton	Dysart et al (Eyre)		
112 FAIRHOLME	45° 35"	79° 54"	31E/13	2EA14	Parry Sound	Hagerman		9999ASS2471
289 FAIRY	45° 20"	79° 11"	31E/7	2EB13	Muskoka	Chaffey-Brunel	**H1**	98030010101
219 FAWN	45° 10"	79° 15"	31E/4	2EB13	Muskoka	Macaulay-Stephenson	**FN**	03008563201
290 FAWN	45° 25"	79° 23"	31E/6	2EB13	Parry Sound	McMurrich		999ERC00019
246 FOGAL (BALSAM)	45° 11"	79° 53"	31E/4	2EB02	Parry Sound	Conger		9999ASS2548, 999ERC00183
123 FOWKE (SPRING)	45° 49"	79° 40"	E/13	2EA17	Parry Sound	Lount		9999ASS2570
291 FOX	45° 22"	79° 21"	31E/6	2EB13	Muskoka	Stisted	**H5**	98030050101, 999ERC00022
96 FRANK	45° 39"	79° 15"	31E/11	2EA21	Parry Sound	Proudfoot		9999ASS6348
594 FREELAND	46° 02"	81° 22"	41I/3	2CF03	Manitoulin	Killarney		9999ASS2591
654 FROOD	46° 08"	81° 40"	41I/4	2CF05	Sudbury	Curtin		
597 GEORGE	46° 02"	81° 24"	41I/3	2CF03	Manitoulin	Killarney	**EM, LT**	96013599603
61 GLEN	45° 08"	78° 30"	31E/1	2HF10	Haliburton	Guilford	**GN**	17002151001
247 GO HOME	45° 00"	79° 50"	31E/4	2EB02	Parry Sound	Gibson		9999ASS2660
292 GOLDEN CITY	45° 19"	79° 24"	31E/6	2EB13	Muskoka	Stisted		999ERC00259
317 GOODWIN (LOON)	45° 15"	78° 39"	31E/7	2HF08	Haliburton	Havelock		9999ASS6376
221 GULLFEATHER	45° 06"	79° 01"	31E/3	2EC15	Muskoka	Oakley	**GF**	03007750001
220 GRANDVIEW	45° 12"	79° 03"	31E/3	2EB09	Muskoka	McLean		9999ASS2702, 999ERC00260
97 GRAPHITE	45° 44"	79° 05"	31E/11	2EA21	Nipissing	Butt		9999ASS2714
144 GRASS	45° 02"	78° 33"	31E/2	2HF09	Haliburton	Dysart	**P53**	98010065301
98 GRASS (SWENY)	45° 41"	79° 12"	31E/11	2EA22	Parry Sound	Proudfoot		9999ASS2715

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
145 GREEN	45° 07"	78° 36"	31E/2	2HF10	Haliburton	Dysart et al (Guilford)	**P22**	98010062201
146 GRINDSTONE	45° 11"	78° 53"	31E/2	2EC15	Muskoka	Ridout		9999ASS2744
293 GROVES	45° 15"	79° 23"	31E/6	2EB13	Muskoka	Stephenson		9999ASS2748
451 GRUNDY	45° 56"	80° 34"	41H/15	2EA02	Parry Sound	Mowat		9999ASS2749
452 GUT	45° 56"	80° 34"	41H/15	2EA02	Parry Sound	Mowat		9999ASS2769
62 HALIBURTON	45° 12"	78° 24"	31E/1	2HF10	Haliburton	Dysart et al	**P2**	98010060201
147 HALLS	45° 06"	78° 45"	31E/2	2HF08	Haliburton	Stanhope	**P39**	98010063901
294 HALLER	45° 26"	79° 19"	31E/6	2EB13	Muskoka	Stisted		999RAR00002
318 HAVELOCK	45° 17"	78° 38"	31E/7	2HF08	Haliburton	Dysart et al	**P9**	98010060901
248 HAMER	45° 14"	79° 48"	31E/4	2EB05	Parry Sound	Humphrey	**HR**	99004000601, 999ERC00185
681 HANNAH	46° 27"	81° 02"	41I/6	2CF08	Sudbury	Broder	**HH**	14002850001, 96016593601
295 HARP	45° 23"	79° 08"	31E/6	2EB13	Muskoka	Chaffey	**HP**	03008557001
295 HARP R. #3	45° 23"	79° 08"	31E/6	2EB13	Muskoka	Chaffey	**HP3**	03008557302
295 HARP R. #3A	45° 23"	79° 08"	31E/6	2EB13	Muskoka	Chaffey	**HP3A**	03008557802
295 HARP R. # 4	45° 23"	79° 09"	31E/6	2EB13	Muskoka	Chaffey	**HP4**	03008557402
295 HARP R. #5	45° 23"	79° 08"	31E/6	2EB13	Muskoka	Chaffey	**HP5**	03008557502
295 HARP R. #6	45° 23"	79° 08"	31E/6	2EB13	Muskoka	Chaffey	**HP6**	03008557602
295 HARP R. #6A	45° 23"	79° 08"	31E/6	2EB13	Muskoka	Chaffey	**HP6A**	03008557902
295 HARP ØF	45° 22"	79° 08"	31E/6	2EB13	Muskoka	Chaffey	**HPØ**	03008557002
457 HARRIS	45° 42"	80° 22"	41H/9	2EA10	Parry Sound	Wallbridge-Harrison		9999ASS2821
799 HAWKEYE	48° 41"	89° 27"	52A/11	2AB06	Thunder Bay	Fowler	**HK**	6006032, 99003001523
148 HEAD	45° 03"	78° 31"	31E/2	2HF09	Haliburton	Dysart	**P52**	98010065201
148 HEAD R. #1	45° 03"	78° 31"	31E/2	2HF09	Haliburton	Dysart	**HD1**	17002150202
222 HEALEY	45° 05"	79° 11"	31E/3	2EB09	Muskoka	Macaulay	**HE**	03008563301, 999ERC00061
8094 HEALEY	45° 10"	79° 55"	31E/4	2EB02	Parry Sound	Conger		9999ASS2857, 999ERC00045
223 HENEY	45° 08"	79° 06"	31E/3	2EB09	Muskoka	McLean	**HY**	03008550501, 999ERC00262
223 HENEY ØF	45° 08"	79° 06"	31E/3	2EB09	Muskoka	McLean	**HYØF**	03008550502
224 HILLMAN	45° 06"	79° 23"	31E/3	2EB04	Muskoka	Monck		9999ASS2898, 999ERC00265
99 HIMBURY (ROCK)	45° 36"	79° 12"	31E/11	2EA22	Parry Sound	Proudfoot		9999ASS2900
149 HINDON	45° 02"	78° 47"	31E/2	2HF10	Haliburton	Anson, Hindon, Minden	**P41**	98010064101
269 HORN	45° 23"	79° 36"	31E/5	2EA14	Parry Sound	Monteith		96015599901
26 HORSESHOE	44° 59"	78° 41"	31D/15	2HF10	Haliburton	Anson, Hindon, Minden	**P44**	98010064401

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
296 HUNTER	45° 27"	79° 28"	31E/6	2EB21	Parry Sound	McMurrich	**HT**	9999ASS2952
49 JACK	44° 42"	78° 02"	31D/9	2HH06	Victoria	Belmont et al.		9999ASS2999
298 JERRY	45° 23"	79° 07"	31E/6	2EB13	Muskoka	Sinclair	**JY**	03008556001, 999ERC00190
481 JOE	46° 44"	81° 01"	41I/11	2CF14	Sudbury	Wisner	**JO**	14002851001, 96016599401
319 JOHNSON	45° 16"	78° 37"	31E/7	2HF08	Haliburton	Dysart et al (Havelock)	**P10**	98010061001
299 JOHNSON	45° 28"	79° 28"	31E/6	2EB22	Parry Sound	McMurrich	**JN**	9999ASS3045
150 KABAKWA (PEACH)	45° 07"	78° 46"	31E/2	2HF10	Haliburton	Stanhope	**P37**	98010063701
320 KAWAGAMA	45° 18"	78° 45"	31E/7	2EB12	Haliburton	Sherborne et al.		MULTI STN
27 KASHAGAWIGAMOG (E)	44° 59"	78° 36"	31D/15	2HF09	Haliburton	Minden	**P54**	98010065401
27KASHAGAWIGAMOG (W)	44° 59"	78° 36"	31D/15	2HF09	Haliburton	Minden	**P55**	98010065501
151 KELLY	45° 15"	78° 37"	31E/2	2HF08	Haliburton	Dysart et al	**P11**	98010061101
152 KENNISIS	45° 13"	78° 38"	31E/2	2HF08	Haliburton	Dysart et al	**P13**	98010061301
101 KERNICK (PIKE)	45° 37"	79° 21"	31E/11	2EA22	Parry Sound	Armour		9999ASS3138
726 KILLARNEY	46° 04"	81° 22"	41I/3	2CF03	Manitoulin	Killarney		96013598801
321 KIMBALL	45° 21"	78° 41"	31E/7	2EB12	Haliburton	Livingston	**KL**	3008563801
40 KOSHLONG	44° 58"	78° 29"	31D/16	2HF06	Haliburton	Glamorgan		9999ASS3186, 999BIO02201
153 KUSHOG NORTH	45° 08"	78° 49"	31E/2	2HF10	Haliburton	Stanhope	P35	98010063501
153 KUSHOG SOUTH	45° 05"	78° 45"	31E/2	2HF10	Haliburton	Stanhope	**P36**	98010063601
510 LABELLE	46° 42"	81° 07"	41I/11	2CF13	Sudbury	Lumsden	**LL**	14002855001
251 LAKE JOSEPH	45° 10"	79° 44"	31E/4	2EB05	Muskoka	Humphrey-Medora	**IJ**	see Table 9.
15 LAKE MUSKOKA	45° 00"	79° 25"	31D/14	2EB04	Muskoka	Monck-Wood-	**IM**	see Table 9.
2557 LAKE NIPISSING	46° 15"	80° 21"	41I/	2DD07	Sudbury	Loudon & Haddo		see Table 9.
225 LAKE OF BAYS	45° 15"	79° 04"	31E/3	2EB10	Muskoka	Franklin-McLean-Ridout	**IB**	see Table 9.
80 LAKE OF THE WOODS	49° 15"	94° 45"	52E/7	5PD01	Kenora	Canada + United States		MULTI STN.
252 LAKE ROSSEAU	45° 10"	79° 35"	31E/4	2EB05	Muskoka	Medora-Watt-Humphrey	**IR**	see Table 9..
801 LAKE 222 (ELA)	49° 42"	93° 44"	52F/12	5QD02	Kenora	E.L.A.	**222**	99ELA000222
802 LAKE 223 (ELA)	49° 42"	93° 42"	52F/12	5QD02	Kenora	E.L.A.	**223**	99ELA000223
803 LAKE 224 (ELA)	49° 41"	93° 43"	52F/12	5QD02	Kenora	E.L.A.	**224**	99ELA000224
804 LAKE 227 (ELA)	49° 41"	93° 40"	52F/12	5QD02	Kenora	E.L.A.	**227**	99ELA000227
300 LANGFORD (LONG)	45° 27"	79° 17"	31E/6	2EB13	Parry Sound	Perry		9999ASS3278
759 LAUNDRIE	47° 07"	80° 52"	41P/2	2DC01	Sudbury	Howey, Gamble		96016599001

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
226 LEECH	45° 03"	79° 06"	31E/3	2EB09	Muskoka	Oakley	**LH**	03008563501, 999ERC00086
227 LEONARD	45° 04"	79° 27"	31E/3	2EB04	Muskoka	Monck	**LD**	03008563401, 999ERC00078
2627 LIMESTONE	45° 33"	79° 56"	31E/12	2EA16	Parry Sound	Hagerman		9999ASS3333
709 LINTON	46° 23"	80° 59"	41I/7	2DB01	Sudbury	Broder		9999ASS3342
154 LIPSY	45° 10"	78° 38"	31E/2	2HF08	Haliburton	Dysart et al	**P19**	98010061901
155 LITTLE BOSHKUNG	45° 02"	78° 44"	31E/2	2HF10	Haliburton	Anson, Hindon, Minden	**P48**	98010064801
156 LITTLE BROTHER	45° 08"	78° 45"	31E/2	2HF08	Haliburton	Stanhope	**P32**	98010063201
324 LITTLE BUCKHORN	45° 15"	78° 40"	31E/7	2HF08	Haliburton	Havelock		9999ASS3363
141 LITTLE CLEAN	45° 15"	78° 31"	31E/7	2HF11	Haliburton	Dysart et al (Eyre)		9999ASS3378
301 LITTLE CLEAR	45° 24"	79° 00"	31E/6	2EB10	Muskoka	Sinclair	**LC**	03008559001, 999ERC00192
81 LITTLE EASTEND	45° 34"	78° 57"	31E/10	2EB13	Nipissing	McCraney	**S6, (LED)**	98020060101
157 LITTLE HAWK	45° 10"	78° 42"	31E/2	2HF08	Haliburton	Stanhope	**P31**	98010063101
158 LITTLE KENNISIS	45° 15"	78° 35"	31E/2	2HF08	Haliburton	Dysart et al	**P12**	98010061201
329 LITTLE MARGARET	45° 08"	78° 54"	31E/3	2EC15	Muskoka	Ridout		9999ASS6594
425 L.ORILLIA (L.BEAVER)	45° 05"	79° 00"	31E/2, 3	2EC15	Muskoka	Oakley		9999ASS3437
272 LITTLE OTTER	45° 18"	79° 57"	31E/5	2EB15	Parry Sound	Foley		9999ASS4546
159 LITTLE REDSTONE	45° 13"	78° 34"	31E/2	2HF11	Haliburton	Dysart et al (Guilford)	**P7**	98010060701
102 LITTLE WHETSTONE	45° 42"	79° 08"	31E/11	2EA22	Parry Sound	Proudfoot	**S16, (LWE)**	98020160101
684 LOHI	46° 23"	81° 02"	41I/6	2CF05	Sudbury	Broder	**LI**	14003551001 96016593001
254 LOUCK'S	45° 12"	79° 48"	31E/4	2EB05	Parry Sound	Conger	**S8, (LS)**	98020080101
402 LOUISA	45° 28"	78° 29"	31E/7, 8	2KD19	Haliburton	Lawrence	**LA**	18349051001
160 LOWER WELCH	45° 06"	78° 47"	31E/2	2HF10	Haliburton	Stanhope	**P38**	98010063801
2900 LYNX	45° 14"	79° 10"	31E/3	2EB13	Muskoka	Brunel		9999ASS3605
161 MACDONALD	45° 14"	78° 34"	31E/2	2HF11	Haliburton	Dysart et al (Havelock)		9999ASS6651
399 MAGGIE	45° 30"	78° 52"	31E/7,10	2EB13	Nipissing	Finlayson	**S7, (MG)**	98020070101, 999ERC00282
273 MANITOUWABA	45° 24"	79° 42"	31E/5	2EA19	Parry Sound	Monteith-Christie		9999ASS6665
162 MAPLE (NINATIGO)	45° 06"	78° 39"	31E/2	2HF10	Haliburton	Stanhope	**P50**	98010065001
163 MARGARET	45° 08"	78° 53"	31E/2	2HF10	Muskoka	Ridout	**P25**	98010062501
164 MARSDEN	45° 12"	78° 33"	31E/2	2HF11	Haliburton	Dysart et al (Harburn)	**P8**	98010060801
231 MARY	45° 15"	79° 15"	31E/3	2EB13	Muskoka	Stephenson-Brunel	**H2**	98030020101
7121 MAYFLOWER	45° 23"	79° 13"	31E/6	2EB15	Muskoka	Chaffey		99999AH0201
711 McFARLANE	46° 25"	80° 59"	41I/7	2CF05	Sudbury	Broder		9999ASS4796

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
6771 McGOWN	45° 20"	80° 00"	31E/5,41H8	2ED13	Parry Sound	Foley	**MGN**	9999ASS5949, 99RI0000601
232 McKAY	45° 03"	79° 10"	31E/3	2EB09	Muskoka	Draper	**MY**	03008563701, 999ERC00287
405 MEACH	45° 18"	78° 08"	31E/8	2KD15	Hastings	McClure		9999ASS3792, 999BIO02601
302 MIDDLE	46° 26"	81° 02"	41I/6	2CF08	Sudbury	Broder	**ME**	14002852001 96016592901
31 MINDEN	44° 57"	78° 42"	31D/15	2HF10	Haliburton	Anson, Hindon, Minden	**P42**	98010064201
68 MOOSE	45° 09"	78° 28"	31E/1	2HF10	Haliburton	Dysart et al (Harburn)	**P4**	98010060401
68 MOOSE INFLOW #1	45° 09"	78° 27"	31E/1	2HF10	Haliburton	Dysart et al (Harburn)	**MS1**	17002151501
233 MOOT	45° 09"	79° 10"	31E/3	2EB09	Muskoka	McLean	**MO**	03008563601, 999ERC00289
33 MOUNTAIN SOUTH	44° 59"	78° 43"	31D/15	2HF10	Haliburton	Anson, Hindon, Minden	**P45**	98010064601
33 MOUNTAIN NORTH	45° 01"	78° 42"	31E/2	2HF10	Haliburton	Anson, Hindon, Minden	**P46**	98010064501
514 MOUNTAINTOP	46° 55"	80° 53"	41I/15	2DA04	Sudbury	Fraleck	**MT**	03013450001
165 MOUSE (Moose)	45° 15"	78° 51"	31E/2	2EC15	Haliburton	Sherborne		MM/MULTISTN.,03007757201
275 MUTTON (MARSH)	45° 21"	79° 46"	31E/5	2EA19	Parry Sound	Christie		9999ASS3975
166 NEHEMIAH (PAUL'S)	45° 12"	78° 48"	31E/2	2EC15	Haliburton	Sherborne		9999ASS3999
647 NELLIE	46° 08"	81° 30"	41I/3,41I/4	2CF05	Sudbury	Roosevelt	**EM,DEEP STN.**	96016598101, 96016598801
515 NELSON	46° 44"	81° 05"	41I/11	2CF13	Sudbury	Bowell (96016598801)	**NE**	140028530-3301, MULTISTN
714 NEPAHWIN	46° 27"	80° 58"	41I/7	2CF08	Sudbury	McKim		9999ASS5945
464 NIPISSING	46° 17"	80° 00"	41I/1-8, 31L/3-6	2DD	Nipissing / ParrySound		MULTISTN 26 SITES Table 9.	
476 NORWAY	46° 34"	80° 48"	41I/10	2DB01	Sudbury	Garson-Falconbridge		
167 NUNIKANI (CRAB)	45° 12"	78° 44"	31E/2	2HF08	Haliburton	Sherborne	**P15, NI**	98010061501, 17002155101
69 OBLONG	45° 11"	78° 26"	31E/1	2HF10	Haliburton	Dysart et al	**P3**	98010060301
258 OLDFIELD	45° 13"	79° 52"	31E/4	2EB02	Parry Sound	Conger		9999ASS6933
115 OLD MANS	45° 37"	79° 39"	31E/12	2EA10	Parry Sound	Spence		9999ASS6932
276 OTTER	45° 17"	79° 58"	31E/5	2EB15	Parry Sound	Foley		9999ASS4544
620 O.S.A.	46° 03"	81° 24"	41I/3	2CF04	Manitoulin	Killarney		96013599001
7206 PAINT INFLOW 1	45° 12"	78° 56"	31E/2	2EB10	Muskoka	Ridout	**PT1**	03008553602
691 PANACHE	46° 15"	81° 20"	41I/6	2CF05	Sudbury	Truman-Dieppe		56017900112-312, 9999ASS4578
108 PEARCELEY (LOON)	45° 42"	79° 30"	31E/11,12	2EA20	Parry Sound	Chapman	**S15, (PY)**	98020150101
305 PENINSULA	45° 20"	79° 06"	31E/6	2EB13	Muskoka	Chaffey-Franklin	**H3**	98030030101
70 PERCY	45° 12"	78° 22"	31E/1	2HF10	Haliburton	Dysart et al	**P1**	98010060101
47 PIGEON	44° 27"	78° 30"	31D/8	2HH02	Peterborough	Victoria, et al		999THRUFALL

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
89 PINCHER	45 º 34"	78 º 51"	31E/10	2EB13	Nipissing	McCraney	**S9, (PN)**	98020090101
171 PINE	45 º 07"	78 º 35"	31E/2	2HF10	Haliburton	Dysart et al (Guilford)	**P23**	98010062301
104 PINE	45 º 41"	79 º 03"	31E/11	2EA22	Nipissing	Butt	**PE**	9999ASS6988
334 PIPIO	45 º 24"	78 º 30"	31E/7	2EB12	Haliburton	Lawrence	**PO**	9999ASS4688
172 PLASTIC (Pine)	45 º 11"	78 º 50"	31E/2	2HF10	Haliburton	Sherborne	**PC**	17002154001
172 PLASTIC R. # 1	45 º 11"	78 º 50"	31E/2	2HF10	Haliburton	Sherborne	**PC1**	17002154102
172 PLASTIC ØF	45 º 10"	78 º 50"	31E/2	2HF10	Haliburton	Sherborne	**PCØ**	17002154002
187 POKER	45 º 03"	78 º 56"	31E/2	2EC15	Haliburton	Hindon	**PR**	03007751501
187 POKER EAST	45º 03"	78 º 56"	31E/2	2EC15	Haliburton	Hindon	**PRE**	03007751401
185 PLOT 2 POND 9	45 º 11"	78 º 49"	31E/2	2HF10	Haliburton	Sherborne	**P2-9**	99994796999
174 PLOT 2 POND 19	45 º 12"	78 º 48"	31E/2	2HF08	Haliburton	Sherborne	**P2-**	99994797102
188 PT10-	45 º 13"	78 º 55"	31E/2	2EB10	Muskoka	Ridout	**PT1-10**	03008551101
717 RAMSEY	46 º 29"	80 º 57"	41I/7	2CF08	Sudbury	McKim & Neelon		9999ASS4796
189 RANGER (Sand)	45 º 09"	78 º 15"	31E/2	2HF10	Muskoka	Ridout	**RM, P26**	17002159301 98010700000
805 RAWSON (ELA 239)	49 º 40"	93 º 45"	52F/12	5QD02	Kenora	E.L.A.		99ELA000239
192 RED CHALK EAST	45 º 11"	78 º 57"	31E/2	2EC15	Muskoka	Ridout	**RCE**	03007752101
192 RED CHALK R. #1	45 º 11"	78 º 57"	31E/2	2EC15	Muskoka	Ridout	**RC1**	03007752102
192 RED CHALK R. #2	45 º 11"	78 º 57"	31E/2	2EC15	Muskoka	Ridout	**RC2**	03007752202
192 RED CHALK MAIN	45 º 11"	78 º 57"	31E/2	2EC15	Muskoka	Ridout	**RCM**	03007752001
192 RED CHALK R. #3	45 º 11"	78 º 57"	31E/2	2EC15	Muskoka	Ridout	**RC3**	03007752302
192 RED CHALK R. #4	45 º 11"	78 º 57"	31E/2	2EC15	Muskoka	Ridout	**RC4**	03007752402
192 RED CHALK ØF	45 º 11"	78 º 57"	31E/2	2EC15	Muskoka	Ridout	**RCØF**	03007752002
193 RED PINE	45 º 12"	78 º 42"	31E/2	2HF08	Haliburton	Sherborne	**P16, RP**	98010061601 7002200000
194 REDSTONE	45 º 11"	78 º 32"	31E/2	2HF11	Haliburton	Dysart et al (Guilford)	**P6**	98010060601
7 RICE	44 º 12"	78 º 10"	31D/1	2HJ02	Peterborough	Monagan,Oton.,Alnwick	**RE**	MULTI. STN. Table 9
454 RICHMOND	45 º 20"	79 º 59"	41H/8, 7	2EA15	Parry Sound	Foley		9999ASS4865

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
4162 RIDOUT	45° 10"	78° 59"	31E/2	2EC15	Muskoka	Ridout	**RT**	9999ASS4867
207 RIL	45° 10"	79° 00"	31E/2, 3	2EB09	Muskoka	Ridout		9999ASS4868, 999ERC00062
459 ROCK ISLAND	45° 33"	80° 15"	41H/9	2EA13	Parry Sound	Shawanaga		9999ASS4889
234 ROSE	45° 14"	79° 21"	31E/3	2EB13	Muskoka	Stephenson		9999ASS4921, 999ERC00050
460 ROUND	45° 31"	80° 08"	41H/9	2EA14	Parry Sound	Ferguson-Burpee	**S10, (RD)**	98020100101
308 ROUND	45° 28"	79° 24"	31E/6	2EB13	Parry Sound	McMurrich	**H7**	98030070101, 999ERC00206
4228 ROUND	45° 38"	80° 11"	41H/9	2EA13	Parry Sound	Burton		999RAR00461
6720 RUSH	44° 43"	78° 56"	31D/10	2EC13	Victoria	Laxton		99994797302
631 RUTH ROY NORTH	46° 05"	81° 15"	41I/3	2CF03	Manitoulin	Carlyle		96013599702
631 RUTH ROY SOUTH	46° 05"	81° 15"	41I/3	2CF03	Manitoulin	Carlyle	**EM**	96013599702
4290 SANS CHAMBRE	46° 43"	81° 09"	41I/11,14	2CF13	Sudbury	Bowell		96016598901
195 SASKATCHEWAN	45° 08"	78° 47"	31E/2	2HF08	Haliburton	Stanhope	**P34**	98010063401
235 SAW	45° 03"	79° 02"	31E/3	2EC15	Muskoka	Oakley		9999ASS5009
8020 SCUGOG	44° 10"	78° 50"	31D/2	2HG04	Durham,	Victoria, Ontario		999BIO03401
197 SHERBORNE	45° 11"	78° 47"	31E/2	2HF08	Haliburton	Sherborne - Stanhope	**P29, SH**	98010062901 17002155001
198 SHOE	45° 12"	78° 55"	31E/2	2EC15	Muskoka	Ridout		9999ASS5099
199 SHOELACE	45° 13"	78° 45"	31E/2	2HF08	Haliburton	Sherborne	**S11, (SL)**	98020110101
200 SILVER BUCK	45° 09"	78° 47"	31E/2	2HF10	Haliburton	Sherborne	**P28**	98010062801
694 SILVER	46° 26"	81° 01"	41I/6	2CF08	Sudbury	Broder		96016596801
44 SIMCOE	44° 25"	79° 20"	31D/6	2EC19	Simcoe,	York, Ontario		MULTI. STN.
117 SIMMONS	45° 36"	79° 42"	31E/13	2EA10	Parry Sound	Croft		99999999924
236 SKELETON	45° 15"	79° 27"	31E/3	2EB07	Muskoka	Cardwell et al.		9999999S001, 98010039301, 9999ASS5133
262 SKIDWAY	45° 12"	79° 52"	31E/4	2EB02	Parry Sound	Conger	**S12, (SY)**	98020120101
358 SLIM	45° 28"	78° 54"	31E/7	2EB15	Muskoka	Finlayson	**P4 - 24**	99994797202
400 SMOKE	45° 31"	78° 41"	31E/7,10	2EB11	Nipissing	Peck	**SM**	03008562001, 999ERC00012
430 SOLITAIRE (CLEAR)	45° 23"	79° 01"	31E/6	2EB15	Muskoka	Sinclair	**SE**	03008560001, 999ERC00220
420 SOYERS	45° 01"	78° 37"	31E/2	2HF09	Haliburton	Minden	**P56**	98010065601
463 STRATHDEE (LONG)	45° 26"	80° 00"	41H8/7	2EA14	Parry Sound	McDougall		9999ASS5288
56 STURGEON	44° 28"	78° 43"	31D/7	2HH03	Victoria	Fenelon-Verulam		MULTI. STN. Table 9.
695 ST. CHARLES	46° 26"	81° 01"	41I/6	2CF08	Sudbury	Broder		9999ASS5251
2 ST. GEORGE, EAST	43° 57"	79° 26"	30M/14	2HC05	Whitchurch	York (R.M.)		99999SGE101

Table 7a cont'd

Body of Water # and Lake	Lat	Long	Map #	Wshed	District/County	Twp	Abbr.	Station Codes
2 ST. GEORGE, WEST	43° 57"	79° 26"	30M/14	2HC05	Whitchurch	York (R.M.)		99999SGW101
421 ST.NORA	45° 09"	78° 50"	31E/2	2HF10	Haliburton	Sherborne	**P27**	98010062701
4575 STONY	44° 33"	78° 06"	31D/9	2HH04	Peterborough	Burleigh, Dummer		9999ASS5280
416 SUGARBUSH	45° 45"	79° 04"	31E/11,14	2EA21	Nipissing	Butt	**SG**	9999ASS5312
3 SUNSET	45° 34"	78° 56"	31E/10	2EB13	Nipissing	McCraney	**S13, (ST)**	98020130101
447 SWAN	46° 22"	81° 04"	41I/6	2CF05	Sudbury	Broder	**SW**	14003552001, 96016599502
429 TABOR (LAMBS)	45° 26"	79° 31"	31E/5	2EB13	Parry Sound	McMurrich		9999ASS5361
445 TERRY	46° 04"	81° 17"	41I/3	2CF03	Manitoulin	Carlyle		96013599101
426 THREE MILE	45° 10"	79° 27"	31E/3	2EB08	Muskoka	Watt		6110606, 6110605, 9999999H001, 999999TM001
415 TIM	45° 45"	79° 02"	31E/11	2KB11	Nipissing	Butt	**TM**	18493057001
431 TIMBERWOLF	45° 41"	78° 48"	31E/10	2KB13	Nipissing	Hunter	**TF**	18493055001
414 TONAKELA	45° 32"	78° 47"	31E/10	2EB15	Nipissing	Peck	**TA**	9999ASS7215
225 TRADING BAY INFLOW #1	45° 14"	78° 55"	31E/2	2EB10	Haliburton	Sherborne	**TB1**	03008553501
423 TWELVE MILE	45° 01"	78° 43"	31E/2	2HF08	Haliburton/	Anson, Hindon, Minden	**P47**	98010064701
423 TWELVE MILE NORTH	45° 02"	78° 41"	31E/2	2HF08	Haliburton	Minden	**TWN**	17002150302
423 TWELVE MILE SOUTH	45° 02"	78° 41"	31E/2	2HF08	Haliburton	Minden	**TWS**	17002150402
432 VERNON	45° 20"	79° 17"	31E/7	2EB13	Muskoka	Stisted - Chaffey	**H4**	98030040101
418 WALKER	45° 23"	79° 05"	31E/6	2EB13	Muskoka	Sinclair	**WR**	03008555001, 999ERC00027
446 WAVY	46° 18"	81° 06"	41I/6	2CF05	Sudbury	Eden	**EM**	96016599102
773 WELCOME	47° 13"	81° 02"	41P/3	2DA02	Sudbury	Valin		96016599201, 96016599202
427 WESTWARD	45° 29"	78° 45"	31E/7	2EB11	Nipissing	Peck	**WD**	03008561001
417 WHALLEY	45° 42"	79° 40"	31E/12	2EA12	Parry Sound	Croft-Chapman		99004071101, 9999ASS5771
419 WINDFALL	45° 45"	79° 06"	31E/14	2EA21	Nipissing	Butt	**S14, (WL)**	98020140101
791 WHITE PINE	47° 16"	80° 49"	41P/7	2DC01	Sudbury	Mcleod/Gamble		96017599401, 96916599601
790 WHITEPINE	47° 23"	80° 38"	41P/7	2DC01	Sudbury	Gamble	**WP**	9999ASS5804, 9999ASS7314
479 WHITSON	46° 35"	80° 58"	41I/10	2CF11	Sudbury	Blezard		96016598401
428 YOUNG (TROUT)	45° 13"	79° 33"	31E/4	2EB07	Muskoka	Watt	**YG**	99004001201, 999ERC00052

Table 7b. Physical characteristics of the DESC study lakes including Acid Sensitivity (Ontario Ministry of the Environment 1989)

(Note: area in hectares and 10^4 m^2 are synonyms & lake names with superscript indicate their Body of Water Number (Table 7a), (refer to the definition presented in the text of Section 6, above). Watershed areas are those previously reported in Reid et al.(1987).

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
AXE	2	264.0	660.0	2.5	15.0		317.5
ARMISHAW							246.9
ARROWHEAD	4	62.1	434.7	7.0	13.4		296.5
ART (SPRUCE)	3	126.4	922.72	7.3	24.7		353.9
AVERY	2	7.5			12.0		399.5
BACK	3	19.4					220.9
BALSAM	5	4665.0	23325.0	5.0	14.9		256.0
BASSHAUNT	3	47.3	366.23	7.7	24.0	837.9	403.9
BASSHAUNT INFLOW 1						28.5	
BASSHAUNT INFLOW 2						381.7	
BASSHAUNT INFLOW 3						20.1	
BASSHAUNT INFLOW 4						192.7	
BASSHAUNT INFLOW 5						29.9	
BASSHAUNT INFLOW 6						73.3	
BASSHAUNT UNGAUGED						64.4	
BAT [72]	2	2.3	6.9	2.9	8.3	34.78	408.4
BAT [126]		43.9	359.98	8.2	19.0		368.8
BAT [455]	3	36.1	75.81	2.1	4.8		245.0
BEAR [1032]	3	94.7	890.18	9.4	36.6		355.1
BEAR [266]	2	325.2	747.96	2.3	7.6		314.6
BEECH	4	124.0	880.4	7.1	26.8		310.9
BEECH INFLOW 1 (BAKER)	4					571.6	327.7
BELL'S(SILVER)	3	42.8	286.76	6.7	13.2		312.0
BELL [575]	2	347.4	2813.94	8.1	26.8		221.0
BELL [453] (BELL'S)	3	57.6	241.92	4.2	8.2		214.9
BENTSHOE	2	27.1	84.01	3.1	8.0		332.5
BIG BROTHER		78.0	327.6	4.2	16.0		359.7
BIG ORILLIA	3	45.3	231.03	5.1	11.9		319.5
BIG PORCUPINE	2	235.0	1774.0	7.5	30.5	2335.1	480.0
BIG PORCUPINE ISLAND						9.7	
BIG PORCUPINE INFLOW 1						84	
BIG PORCUPINE INFLOW 2						23	
BIG PORCUPINE INFLOW 3						401	
BIG PORCUPINE INFLOW 4						112	
BIG PORCUPINE INFLOW 5						1065	
BIG PORCUPINE INFLOW 6						81	
BIG PORCUPINE UNGAUGED						324	
BIG EAST L.	2	146.4	936.96	6.4	32.3		320.5
BIG HAWK	2	389.0	6472.51	18.1	59.0		359.7

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
BIGWIND	3	111.0	1180.0	10.7	32.0	507.4	319.0
BIGWIND INFLOW 1						20.7	
BIGWIND INFLOW 2						160	
BIGWIND INFLOW 3						75.5	
BIGWIND UNGAUGED						140.2	
BIRD	3	62.4	193.44	3.1	7.3		307.0
BITTERN		56.9	193.46	3.4	7.0		335.5
BLACK	1	25.4	43.18	1.7	4.0		240.0
BLUE CHALK	3	52.35	446.8	8.5	23.0	158.28	343.5
BLUE CHALK R.#1						20.43	
BLUE CHALK R.ØF							343.5
BLUE CHALK UNGAUGED						85.5	
BOB	3	228.0	4104.0	18.0	60.9		296.9
BOWLAND	1	108.4	747.96	6.9	28		392.5
BONNECHERE	2	105.0	672.0	6.4	21.4		480.0
BOSHKUNG	3	716.0	16682.8	23.3	71.0		307.5
BRANDY	3	108.0	378.0	3.5	7.5		227.0
BUCK [312]	3	40.3	439.27	10.9	30.0	291.1	376.0
BUCK INFLOW 1						90.1	
BUCK INFLOW 2						9.3	
BUCK INFLOW 3						77.6	
BUCK INFLOW 4						4.1	
BUCK INFLOW 5						5.9	
BUCK UNGAUGED						63.8	
BUCK [287]	3	265.7	2630.43	9.9	23.5		301.5
BUCKHORN	5						246.0
BURNSIDE							320.5
CANNING	4	244.1	1635.47	6.7	22.3		317.9
CARLYLE	2	156.7	893.19	5.7	14.6		210.0
CAT	2	57.9			55.0		370.3
CHEER	2	90.1			7.9		358.0
CHEMONG	5						246.0
CHUB	2	34.41	306.25	8.9	27.0	306.25	371.0
CHUB R. #1						59.69	
CHUB R. #2						126.0	
CHUB R. ØF.							371.0
CHUB UNGAUGED						86.15	
CINDER	2	26.9	129.12	4.8	16.0		332.0
CINDER EAST	2	50.1	506.01	10.1	36.5		332.0

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
CLAM (BIG CLAM)	3	74.4	461.28	6.2	18.9		379.8
CLARA	2	30.2	138.92	4.6	11.0	397.1	495.3
CLARA BELLE							294.1
CLAYPACK		25.0					358.1
CLAYTON	1	10.1	35.35	3.5	8.2		427.0
CLEAN	3	160.0	2368.0	14.8	43.3		376.0
CLEAR [142]	2	88.4				311.27	368.0
CLEAR UNGAUGED						222.87	
CLEAR [214]	3	103.8	965.34	9.3	26.8		330.3
CLEARWATER	1	76.5	634.95	8.3	21.5	418.6	285.0
CLYDE	1	13.5					488.0
CODE							205.7
COMPASS		48.6	126.36	2.6	7.0		335.3
COSTELLO CREEK	3						418.8
CRADLE	2	17.9	221.96	12.4	33.3	55.39	472.4
CRANBERRY	4	80.0	272.0	3.4	10.4		323.1
CRAWFORD (OTTER)	3	93.2	270.28	2.9	6.7		279.5
CROSSON	2	56.74	522.0	9.2	25.0	578.49	332.0
CROSSON INFLOW 1						456.27	
CROSSON UNGAUGED						65.48	
CROWN	2	136.0	1088.0	8.0	30.0	500.8	480.0
CROWN ISLAND						1.8	
CROWN INFLOW 1						48	
CROWN INFLOW 2						22	
CROWN INFLOW 3						30	
CROWN INFLOW 4						11	
CROWN INFLOW 5						12	
CROWN INFLOW 6						17	
CROWN UNGAUGED						223	
CRYSTAL	4	41.0	176.3	4.3	17.1	179.91	480.1
DAWSON POND	2	0.5			3.8		376.0
DEAVY		8.9					320.0
DELANO	3	23.9	169.69	7.1	18.6	246.39	449.6
DELANO UNGAUGED						222.49	
DEVINE	3	40.1	152.38	3.8	8.8		305.0
DICKEY	5	207.7	3821.68	18.4	50.9		312.4
DICKIE	2	93.6	468.0	5.0	12.0	500.02	354.5
DICKIE INFLOW 5						29.98	
DICKIE INFLOW 6						21.8	

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
DICKIE R. #8						66.96	
DICKIE R. #10						78.89	
DICKIE R. #11						76.27	
DICKIE UNGAUGED						132.52	
DOUGHNUT	1	11.1	31.08	2.8	7.9		472.0
DOWNES	3	45.9					403.9
DRAG	4	1003.4	18061.2	18.0	54.8		353.9
DRUMMER	2	24.2	87.12	3.6	10.2	287.74	495.3
DUCK [6721]	5	44.4	57.72	1.3	3.5		273.0
DUCK [209]	3	86.0					315.5
DUCK INFLOW #1	3					47.3	315.5
EAGLE	4	235.0	1645.0	7.0	24.4		348.1
ECHO	3	209.0	961.45	4.6	11.9		332.5
EYRE (BLACK)		67.0	536.0	8.0	17.4		376.4
FAIRHOLME	3	66.3	344.76	5.2	23.8		266.7
FAIRY	3	711.9	15590.61	21.9	69.5		283.0
FAWN [219]	2	85.8	300.3	3.5	7.9		297.0
FAWN [290]				East bay of BUCK Lake			301.5
FOGAL (BALSAM)	2	11.8	25.96	2.2	5.0		205.7
FOWKE (SPRING)	4	243.7	3509.28	14.4	53.3		299.0
FOX	3	136.7	779.19	5.7	12.2		294.5
FRANK	2	19.4	38.8	2.0	5.0		388.6
FREELAND	2	47.7	52.47	1.1	3.5		192.0
FROOD							190.5
GEORGE	1	188.5	3091.4	16.4	36.6		189.0
GLEN	5	16.3	117.36	7.2	15.0	113.5	358.0
GLEN INFLOW 1						20.9	
GLEN INFLOW 2						32.4	
GLEN UNGAUGED						43.9	
GO HOME	3	666.5	5731.9	8.6	32.6		195.0
GOLDEN CITY	1	16.1	57.96	3.6	13.9		327.7
GOODWIN (LOON)	2	47.6	390.32	8.2	2.5		405.4
GULLFEATHER	2	65.9	316.32	4.8	13.0	1048	318.0
GULLFEATHER INFLOW 1						571.1	
GULLFEATHER INFLOW 2						306.6	
GULLFEATHER UNGAUGED						104.4	
GRANDVIEW	3	77.0	723.8	9.4	22.9		345.0
GRAPHITE	2	68.4	328.32	4.8	14.3		461.8
GRASS [144]	4	63.7	216.58	3.4	9.5		318.0

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
GRASS [94] (SWENY)	2	138.9	1541.79	11.1	36.6		371.9
GREEN	4	131.0	655.0	5.0	12.2		314.6
GRINDSTONE	2	32.4	369.36	11.4	26.2		357.5
GROVES	2	22.5					327.7
GRUNDY	4	62.2	298.56	4.8	12.5		175.3
GUT	4	12.0	45.6	3.8	11.3		175.3
HALIBURTON	3	1014.0	17947.8	17.7	54.9		360.3
HALLS	2	543.0	15312.6	28.2	80.5		325.8
HALLER		13.9			9.0		326.0
HAVELOCK [318]	2	198	2138.4	10.8	30.5		414.5
HAMER	2	35.2	116.16	3.3	8.5		236.0
HANNAH		27.3	10.2	4.0	8.5	103.6	285.0
HARP	3	71.38	949.35	13.3	37.5	542.04	327.0
HARP R. #3						26	327.0
HARP R. #3A						19.65	327.0
HARP R. # 4						119.09	327.0
HARP R. #5						190.53	327.0
HARP R. #6						9.97	327.0
HARP R. #6A						15.28	327.0
HARP UNGAUGED	3					90.14	327.0
HARRIS	3	363.4	1562.62	4.3	18.3		210.3
HAWKEYE	4	435.8	5098.86	11.7	33.6		458.0
HEAD [148]	4	62.2	161.72	2.6	5.6		317.0
HEAD R. #1	4					48.3	317.0
HEALEY [222]	2	122.0	341.6	2.8	7.0		307.5
HEALEY [249]	3	763.4	4351.38	5.7	22.8		194.2
HENEY	2	21.37	70.52	3.3	5.8	93.03	345.5
HENEY INFLOW 1						29.34	
HENEY INFLOW 2						13.69	
HENEY INFLOW 3						3.4	
HENEY INFLOW 4						2.5	
HENEY UNGAUGED		93.03				21.37	345.5

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
HILLMAN	3	10.9					273.0
HIMBURY (ROCK)	3	53.4					342.9
HINDON	4	35.0	112.0	3.2	9.0		350.5
HORN	2	9.1					319.0
HORSESHOE	3	290.0	2349.0	8.1	22.8		305.4
HUNTER	1	8.9	48.06	5.4	12.5		335.0
JACK	5	1221.3	9418.92	8.4	42.7		275.2
JERRY	3	50.1	621.24	12.4	35.0	910.7	330.5
JERRY INFLOW 1						7.3	
JERRY INFLOW 3						666.3	
JERRY INFLOW 4						41.0	
JERRY UNGAUGED						146.0	
JOE	2	179.6	2011.52	11.2	34.0		367.0
JOHNSON	2	151.0	2778.4	18.4	45.1		374.9
JOHNSON	1	4.1	7.38	1.8	6.7		335.0
KABAKWA (PEACH)	3	115.0	793.5	6.9	19.5		358.0
KAWAGAMA	3	2818.8	61449.8	21.8	73.2		355.1
KASHAGAWIGAMOG EAST	4	817.7	10548.3	12.9	23.2		317.9
KASHAGAWIGAMOG WEST	4				39.6		317.9
KELLY	2	99.0	2178.0	22.0	31.0		374.9
KENNISIS	3	1418.0	33.323.0	23.5	68.0		369.4
KERNICK (PIKE)	2	44.2	322.66	7.3	22.6		341.4
KILLARNEY	1	326.5	3526.2	10.8	61.0		204.2
HALLER		13.9			9.0		326.0
KIMBALL	2	213.0	4686.0	22.0	61.0		358.1
KOSHLONG	3	409.0	4171.8	10.2	42.0		346.6
KUSHOG SOUTH	3	370.0	2627.0	7.1	26.0		332.8
LABELLE	3	6.2	23.56	3.8	10.2		370.0
LAKE JOSEPH	3	5375.1	132765.0	24.7	82.9		225.5
LAKE MUSKOKA	3	11906.9	325058.4	27.3	67.1		223.5
LAKE NIPISSING	4	87400.0					195.7
LAKE OF BAYS	3	6861.0	160547.4	23.4	79.3		315.0
LAKE OF THE WOODS	5	384621.6					323.1
LAKE ROSSEAU	3	6294.9	147300.7	23.4	90.2		225.0
LAKE 222 (ELA)		17.5		5.4			120.4
LAKE 223 (ELA)							123.4
LAKE 224 (ELA)							125.6

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
LAKE 227 (ELA)		5.0	22.0	4.4	10.0		125.6
LANGFORD (LONG)	3	42.1	130.51	3.1	6.7		342.9
LAUNDRIE	2	364.0	2147.6	5.9	22.0		388.6
LEECH	3	82.0	516.6	6.3	13.7		310.5
LEONARD	2	195.0	1345.5	6.9	15.2		264.5
LIMESTONE	4	66.7	246.79	3.7	11.6		251.8
LIPSY	2	69.0	545.1	7.9	52.1		410.9
LITTLE BOSHKUNG	3	127.0	850.9	6.7	14.3		307.5
LITTLE BROTHER		26.0	62.4	2.4	4.2		358.0
LITTLE BUCKHORN	2	23.7	111.39	4.7	16.0		405.4
LITTLE CLEAN	3	22.0	165.0	7.5	14.0		376.4
LITTLE CLEAR	3	10.9	88.29	8.1	25.0	579.8	374.5
LITTLE CLEAR INFLOW 1						25.1	
LITTLE CLEAR INFLOW 2						15.3	
LITTLE CLEAR INFLOW 3						3.1	
LITTLE CLEAR UNGAUGED						525.4	
LITTLE EASTEND	2	11.7	70.2	6.0	15.5	91.89	510.5
LITTLE HAWK	2	343.0	10838.8	31.6	93.0		359.7
LITTLE KENNISIS	2	230.0	3473.0	15.1	43.9		369.1
LITTLE MARGARET (ROCK)	3	22.5	234.0	10.4	23.5		346.0
LITTLE ORILLIA (L.BEAVER)	3	25.6	89.6	3.5	6.7		327.7
LITTLE OTTER	3			*Bay within OTTER Lake*			206.0
LITTLE REDSTONE	3	226.0	2892.8	12.8	62.2		364.2
LITTLE WHETSTONE (ROCK)	2	10.6	38.16	3.6	13.6	76.81	419.1
LOHI	1	40.5	251.1	6.2	19.5	557.5	282.0
LOUCK'S	2	20.8	47.84	2.3	8.2	108.54	236.2
LOUISA	2	513.0	8259.3	16.1	61		440.4
LOWER WELCH	4	16.0	52.8	3.3	15.5		358.0
LYNX	3	21.4					349.0
MACDONALD	3	138.0	1380.0	10.0	23.0		388.6
MAGGIE	2	138.6	1413.72	10.2	31.0	289.96	485.0
MANITOUWABA	2	164.5	707.35	4.3	18.6		288.0
MAPLE (NINATIGO)	4	336.0	3964.8	11.8	36.6		314.6
MARGARET	3	60.0	684.0	11.4	32.3		349.5
MARSDEN	3	230.0	2576.0	11.2	21.0		376.4
MARY	3	1065.6	26320.32	24.7	56.4		280.7
MAYFLOWER		6.3	51.66	8.2	21.5		337.0
MCGOWN		20.24	127.4	6.3	12		205.7
McKAY	3	121.5	631.88	5.2	19.5		302.0
MEACH	3	43.7	183.54	4.2	12.2		457.0

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
MIDDLE	3	28.2	17484	6.2	15	274.6	284.0
MINDEN	4	53.0	206.7	3.9	9.1		292.6
MOOSE	4	290.0	4582.0	15.8	43.9		348.1
MOOSE INFLOW #1	4					437.9	348.1
MOOT	2	46.2	124.74	2.7	7.9		335.5
MOUNTAIN SOUTH	4	255.0	3442.5	13.5	31.4		308.8
MOUNTAIN NORTH	4	64.0			24.4		308.8
MOUNTAINTOP	3	4.9	21.07	4.3	9.5		376.4
MOUSE (MOOSE) [165]	2	9.0	44.1	4.9	9.0		351.5
MUTTON (MARSH)	3	45.0	81.0	1.8	5.5		225.6
NEHEMIAH (PAUL'S)	2	9.1	38.22	4.2	17.4		403.9
NELLIE	1	260.5	5001.6	19.2	54.9		268.8
NELSON	2	309.0	3584.4	11.6	51.0	1108.0	351.4
NIPISSING	5	87400.0					196.3
NORWAY							286.5
NUNIKANI (CRAB)	2	116.0	916.4	7.9	24.0	796.6	373.0
NUNIKANI ISLAND						0.6	
NUNIKANI INFLOW 1						24.0	
NUNIKANI INFLOW 10						50.0	
NUNIKANI INFLOW 2						20.0	
NUNIKANI INFLOW 3						16.0	
NUNIKANI INFLOW 4						214.0	
NUNIKANI INFLOW 5						35.0	
NUNIKANI INFLOW 6						81.0	
NUNIKANI INFLOW 7						68.0	
NUNIKANI INFLOW 8						5.0	
NUNIKANI INFLOW 9						5.0	
NUNIKANI UNGAUGED						162.0	
OBLONG	4	91.0	910.0	10.0	27.5		360.3
OLDFIELD	2	20.9					205.7
OLD MANS	3	91.4	383.88	4.2	8.8		281.9
OTTER	3	506.5	5470.2	10.8	44.8		206.0
O.S.A.	1	278.9	3346.8	12.0	39.7		213.9
PAINT INFLOW 1	3	23.15					315.5
PANACHE	3	11660.0	171402.0	14.7	56.4		223.4
PEARCELEY (LOON)	1	44.1	207.27	4.7	8.1	159.35	358.4
PENINSULA	3	822.9	8146.71	9.9	34.1		283.0
PERCY	4	596.0	6556.0	11.0	34.0		388.6
PIGEON	5	5670.0	18711.0	3.3			246.0

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
PINCHER	2	42.1	256.81	6.1	15.5	300.43	510.5
PINE [171]	4	111.8	849.68	7.6	20.4		317.0
PINE [104]	1	24.2	142.78	5.9	20.7		442.0
PIPIO	1	6.9			2.0		472.0
PLASTIC (PINE)	2	32.14	253.9	7.9	16.3.0	127.64	376.4
PLASTIC INFLOW 1						23.34	
PLASTIC INFLOW 2						4.01	
PLASTIC INFLOW 2A						0.99	
PLASTIC INFLOW 3						5.15	
PLASTIC INFLOW 5						5.18	
PLASTIC INFLOW 6						12.33	
PLASTIC UNGAUGED	2					39.69	
POKER	3	15.3	96.39	6.3	17.5		332.0
POKER EAST	3	5.4	37.26	6.9	20.5		332.0
PLOT 2 POND 9		0.3			0.5		384.0
PLOT 2 POND 19		3.8			7.1		403.0
PT10-		0.8	2.56	3.2	6.0		382.0
RANGER (SAND)	3	11.3	63.28	5.6	13.0		340.0
RAWSON (ELA 239)		54.0	567.0	10.5			119.5
RED CHALK LAKE						589.49	343.0
BLUE CHALK OUTFLOW						158.28	
RED CHALK EAST	3	13.05	74.39	5.7	19.0		343.0
RED CHALK R. #1						133.58	
RED CHALK R. #2						26.96	
RED CHALK MAIN	3	44.08	736.14	16.7	38.0		343.0
RED CHALK R. #3						70.49	
RED CHALK R. #4						45.46	
RED CHALK UNGAUGED						97.59	343.0
RED PINE	2	365.0	3686.5	10.1	38.7		342.9
REDSTONE	3	1193.0	26126.7	21.9	82.4		364.2
RICE	5	10010.0	24024.0	2.4	8.0		186.8
RICHMOND		38.1	171.45	4.5	13.0		210.0
RIDOUT	3	46.8	313.56	6.7	20.4		352.0
RIL	3	146.0	496.4	3.4	9.1		342.0
ROCK ISLAND	3	144.9	840.42	5.8	13.7		201.2
ROSE	2	30.4	124.64	4.1	10.4		301.8
ROUND [460]	1	226.0	994.4	4.4	11.6	790.21	221.0
ROUND [308]	3	190.4	1161.44	6.1	21.3		305.5
ROUND [4228]							240.8

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
RUSH	5	34.4			3		268.0
RUTH ROY NORTH	1	46.1	295.04	6.4	18		210.0
RUTH ROY SOUTH	1			north /south above			210.0
SANS CHAMBRE	1	15.0			15		373.4
SASKATCHEWAN		31.0	65.1	2.1	4.3		358.0
SAW	2	27.7	130.19	4.7	13.1		331.0
SCUGOG	5	6374.0	11473.2	1.8	7.0		249.9
SHERBORNE	2	252.0	2419.2	9.6	35.1	1900.0	357.0
SHERBORNE ISLAND						25.0	
SHERBORNE INFLOW 1						8.0	
SHERBORNE INFLOW 10						164.0	
SHERBORNE INFLOW 11						36.0	
SHERBORNE INFLOW 12						17.0	
SHERBORNE INFLOW 13						24.0	
SHERBORNE INFLOW 14						12.0	
SHERBORNE INFLOW 2						7.0	
SHERBORNE INFLOW 3						238.0	
SHERBORNE INFLOW 4						43.0	
SHERBORNE INFLOW 5						29.0	
SHERBORNE INFLOW 6						430.0	
SHERBORNE INFLOW 7						89.0	
SHERBORNE INFLOW 8						12.0	
SHERBORNE INFLOW 9						38.0	
SHERBORNE UNGAUGED						476.0	
SHOE	3	38.6	212.3	5.5	16.8		378.0
SHOELACE	2	7.2	32.4	4.5	12.0	50.91	408.4
SILVER BUCK	2	24.0	223.2	9.3	26.2		358.0
SIMCOE	5	72030.0			39.3	36346.2	218.8
SIMMONS		80.0			3.4		297.2
SKELETON	3	2155.4	62291.1	28.9	64.7		280.4
SKIDWAY	2	18.5	53.65	2.9	7.8	110.66	228.6
SLIM		8.9			8.7		449.6
SMOKE	3	679.0	10999.8	16.2	55.0		421.2
SOLITAIRE (CLEAR)	3	124.0	649.2	13.3	31.0	503.1	374.5
SOLITAIRE INFLOW 1						16.2	
SOLITAIRE INFLOW 2						17.2	
SOLITAIRE INFLOW 3						99.0	
SOLITAIRE INFLOW 4						124.7	
SOLITAIRE UNGAUGED						122.0	

Table 7b cont'd

Lake	Acid Sens.	Area (ha)	Volume (10^4 m^3)	Zmean (m)	Zmax (m)	Watershed (10^4 m^2)	Elev. (masl)
SOYERS	4	329.3	4708.99	14.3	48.8		318.0
STRATHDEE (LONG)	3	31.6	101.12	3.2	6.7		336.2
STURGEON	5	4710.0	17898.0	3.8	10.0		247.8
ST. GEORGE, EAST		4.8	26.4	5.5	16.0		304.8
ST. GEORGE, WEST		3.4	17.68	5.2	15.0		304.8
ST.NORA	3	262.0	4192.0	16.0	39.0		332.8
STONY	5						234.4
SUGARBUSH	2	53.6	101.84	1.9	5.5		457.0
SUNSET	2	12.9	23.22	1.8	6.5	79.88	510.5
SWAN	1	5.8	16.24	2.8	8.8		286.5
TABOR (LAMBS)	2	13.1	43.23	3.3	7.0		335.3
TERRY	1	11.5	35.65	3.1	8.0		210.0
THREE MILE	3	929.2	3159.28	3.4	11.0		246.9
TIM	2	182.6	1241.68	6.8	19.8		450.8
TIMBERWOLF	2	167.0	1235.8	7.4	20.4		419.0
TONAKELA	1	10.5			5.0		500.0
TRADING BAY INFLOW #1	3					7.9	315.0
TWELVE MILE	3	336.8	4041.6	12.0	27.4		307.5
TWELVE MILE NORTH	3					426.7	327.7
TWELVE MILE SOUTH	3					171.8	327.7
VERNON	3	1454.0	19192.8	13.2	36.6		283.0
WALKER	3	68.2		6.2	17.0	325.8	359.5
WALKER INFLOW 1						33.1	
WALKER INFLOW 2						102.5	
WALKER INFLOW 3						5.9	
WALKER INFLOW 4						6.8	
WALKER INFLOW 5						15.7	
WALKER INFLOW 6						20.3	
WALKER UNGAUGED						73.3	
WAVY	1	255.0	2575.5	10.1	34.0		262.1
WELCOME	3	670.0	4958.0	7.4	27.4		361.0
WESTWARD	3	63.3	1297.65	20.5	44.4	228.26	428.5
WESTWARD UNGAUGED						165.26	
WHALLEY	3	96.5	173.7	1.8	3.4		288.9
WINDFALL	1	25.7	113.08	4.4	13.8	133.85	457.5
WHITE PINE	1	67.0	395.3	5.9	22.0		412.0
WHITEPINE [790]	1	77.8	591.28	7.6			412.0
YOUNG (TROUT)	3	105.9	1270.8	12.0	21.1		241.5

Table 8. Revised Summary of morphometric data for the multiple basin study lakes: Lakes Muskoka, Joseph, Rosseau and Lake of Bays station descriptions and their associated areas including calculated areas for the missing sector and corrected navigable river areas unreported in Girard et al. (1990).

Station No.	Station Name	Corrected Areas (ha)	Mean Depth (m)	Maximum Depth (m)	Volume (m^3 x10^5)
Lake Muskoka		11,906.92	27.3	67.1	32,472.3
IM1	Gravenhurst Bay	174.02	10.1	15.2	175.0
IM2	South Bay	492.27	8.7	18.3	427.7
IM3	Stephens Bay	72.92	7.5	18.3	54.9
IM4	Birch Island (East)	758.73	6.5	15.9	490.3
IM5	Walker's Point	2,020.51	19.6	52.4	3957.0
IM6	Pine Needle Point	124.45	5.1	11.3	63.3
IM7	Bala Bay	593.06	9.8	37.2	579.1
IM8	Dudley Bay	351.33	7.9	18.3	276.4
IM9	North Bay	1,099.98	11.0	28.7	1210.0
IM10	East Bay	719.16	18.0	41.8	1295.0
IM11	Crown Island	2,033.12	25.5	67.1	5174.0
IM12	Mirror Lake	50.91	2.8	5.8	14.1
IM13	Muskoka Bay	233.96	7.3	13.5	170.9
IM14	Cliff Bay (part of Muskoka Bay)				
IM15 (extra)	Alport Lake	64.06			
IM16(extra)	Hardy Lake Park	175.00			
IM17(extra)	Rex Island	2,6170.00			
IM18(extra)	Beechgrove Island	773.44			
(extra) = areas not included in DR90/4 (1986)					
Total Surface Area		11,906.92			
Muskoka River North Branch		* 60.94			
Muskoka River South Branch		* 21.56			
Indian River (Mirror Lake to Locks) *		26.25			
*Navigable from Lake Muskoka					
Lake Area plus River Area		12,015.67			
Lake Joseph		5,375.05	24.7	82.9	13,296.1
IJ1	Frazer Island	75.81	10.4	29.0	78.5
IJ2	Hamer Bay	115.43	17.8	46.9	205.6
IJ3	Gordon Bay	99.42	12.3	35.1	122.7
IJ4	Yoho Island	1,737.27	36.8	82.9	6399.0
IJ5	Little Lake Joseph	294.98	16.0	38.7	470.8
IJ6	Chief's Island	237.75	8.8	18.9	209.4
(IJ7)	(Joseph River)	(74.85)	3.4	7.6	25.1
IJ8	Badgerow Island	510.61	17.2	37.5	878.7
IJ9	Footes Bay	243.28	16.2	36.6	394.7
IJ10	Black Forest Island	424.86	11.2	26.2	474.5
IJ11	Cox Bay	184.40	7.0	14.0	129.9
IJ12 (extra)	Burnegie Bay	455.62			
IJ13 (extra)	Playfair Island	260.00			
IJ14 (extra)	Stanley Bay	102.50			
IJ15 (extra)	Little Chief's Bay	78.75			
IJ16 (extra)	Ladies Bay	44.37			
IJ17 (extra)	Loon Island	326.25			
IJ18 (extra)	Crane Island	183.75			
(extra)=areas not included in DR90/4 (1986)					
Total Surface Area		5,375.05			
Joe River Area		74.85			
Lake Area plus River Area		5,449.90			

Cont'd

Table 8 cont'd .

Station No.	Station Name	Corrected Areas (ha)	Mean Depth (m)	Maximum Depth (m)	Volume (m^3 x10^5)
Lake Rosseau		6,294.97	23.4	90.2	14,726.7
IR1	Cameron Bay	92.85	7.1	13.4	66.0
IR2	Morgan Bay	257.24	11.7	29.6	300.1
IR3	Wiley's Bay	36.44	9.9	18.3	35.9
IR4	Skeleton Bay	172.47	9.9	20.1	170.5
IR5	Rest Harbour	136.67	11.3	22.3	155.1
IR6	Tobin Island	1,242.57	16.6	35.1	2064.0
IR7	Portage Bay	145.21	6.7	12.8	98.0
IR8	Brackenrig Bay	42.44	1.9	4.3	8.2
IR9	Arthurlie Bay	107.86	5.0	7.3	53.5
IR10	Minette Ouno Is.)	122.61	6.7	15.5	81.7
IR11	Venetia Group	1,188.25	23.5	46.6	2792.0
IR12	Mutchinbaker Bay	1,754.73	38.4	90.2	6731.0
IR13(extra)	Rostrevor	229.69			
IR 14(extra)	Pickerel Point	28.44			
IR14 (extra)	Black Rock Point	737.50			
(extra)=areas not included in DR90/4 (1986)					
Indian River (Greenridge Point to Locks)		52.50			
Lake Area plus River Area		6,347.47			
Lake of Bays		6860.81	23.37	79.3	15,003.5
IB1	Pancake Bay	69.60	4.5	13.4	31.8
IB2	Trading Bay	425.70	18.7	47.2	797.2
IB3	Rabbit Bay	72.50	10.6	22.9	77.1
IB4	Ten Mile Bay	779.30	13.3	41.2	1039.0
IB5	Bigwin Isl.	652.60	17.7	56.4	1155.0
IB6	Haystack Bay	245.00	12.5	40.8	306.8
IB7	Dwight Bay	649.60	22.3	53.3	1447.0
IB8	Portage Bay	173.60	14.5	47.2	252.2
IB9	Seagull Rk	902.70	28.2	57.9	2543.0
IB10	Roothog Isl	1675.00	26.4	79.3	4428.0
IB11	Whitehouse Bay	402.70	19.0	47.2	764.5
IB12	Whiskey Bay	812.20	26.6	68.0	2162.0
IB13 Burnt Isl	(Inclusive of Whiskey Bay)				

Table 9. Multiple basin lake sample studies established in 1986:showing field ID, latitude, longitude and station codes for lakes Muskoka, Joseph, Rosseau and Lake of Bays. Multiple basin sample locations established in 1975 showing field ID, UTM coordinates, Zone 17, station codes and Topographic Map Numbers at 1:50,000 scale for Lake Nipissing and multiple basin sample locations established in 1986 -89 showing field ID, and station codes for Rice and Sturgeon lakes (bottom)

Field ID	Description	Latitude (deg, min, sec)	Longitude	Station code	Topographic Map
Lake Muskoka		45° 00"	79° 25"		31D14
IM1	Gravenhurst Bay	44 55 40	79 24 00	98010040101	31D14
IM2*	South Bay	44 57 50	79 23 15	98010040201	31D14
IM3	Stephens Bay	45 00 20	79 22 00	98010040301	31E3
IM4	Birch Island	44 02 15	79 24 40	98010040401	31E3
IM5*	Walkers Point	45 02 30	79 27 10	98010040501	31E3
IM6	Pine Needle Point	45 00 00	79 29 00	98010040601	31D14
IM7*	Bala Bay	45 00 15	79 36 20	98010040701	31E4
IM8	Dudley Bay	45 02 30	79 36 45	98010040801	31E4
IM9*	North Bay	45 02 15	79 35 00	98010040901	31E4
IM10*	East Bay	45 02 40	79 32 15	98010041001	31E4
1M11*	Crown Island	45 04 15	79 31 00	98010041101	31E4
IM12	Mirror Lake	45 06 25	79 34 30	98010041201	31E4
IM13	Muskoka Bay	44 56 45	79 24 25	98010041301	31D14
IM14	Cliff Bay	44 56 40	79 23 45	98010041401	31D14
Lake Joseph		45° 10"	79° 44"		31E4
IJ1	Fraser Island	45 15 15	79 45 30	98010020101	31E4
IJ2*	Hamer Bay	45 13 45	79 46 30	98010020201	31E4
IJ3	Gordon Bay	45 12 20	79 47 15	98010020301	31E4
IJ4*	Yoho Island	45 11 20	79 44 40	98010020401	31E4
IJ5	Little Lake Joseph	45 12 15	79 41 15	98010020501	31E4
IJ6	Chief's Island	45 10 20	79 41 45	98010020601	31E4
IJ7	Joseph River	45 09 10	79 40 15	98010020701	31E4
IJ8*	Badgerow Island	45 09 00	79 43 00	98010020801	31E4
IJ9	Footes Bay	45 08 20	79 43 40	98010020901	31E4
IJ10*	Black Forest Island	45 07 45	79 40 30	98010021001	31E4
IJ11	Cox Bay	45 06 30	79 37 30	98010021101	31E4
Lake Rosseau		45° 10"	79° 35"		31E4
IR1	Cameron Bay	45 15 00	79 38 45	98010030101	31E4
IR2	Morgan Bay	45 13 45	79 39 50	98010030201	31E4
IR3*	Wiley's Bay	45 12 20	79 37 15	98010030301	31E4
IR4	Skeleton Bay	45 12 50	79 34 10	98010030401	31E4
IR5*	Rest Harbour	45 11 30	79 36 45	98010030501	31E4
IR6*	Tobin Island	45 08 40	79 33 10	98010030601	31E4
IR7	Portage Bay	45 09 15	79 31 30	98010030701	31E4
IR8	Brackenrig Bay	45 07 05	79 31 30	98010030801	31E4
IR9	Arthurlie Bay	45 07 00	79 33 00	98010030901	31E4
IR10	Minett	45 09 30	79 38 30	98010031001	31E4
IR11*	Venetia Group	45 08 40	79 36 20	98010031101	31E4
IR12*	Mutchinbacker Bay	45 13 30	79 36 30	98010031201	31E4
** stations discontinued in 1987.*					
Lake of Bays		45° 15"	79° 04"		31E3
IB1	PancakeBay	45 15 00	78 53 00	98010010101	31E2
IB2	Trading Bay	45 14 05	78 54 00	98010010201	31E2
IB3	Rabbit Bay	45 15 05	78 54 06	98010010301	31E7
IB4	Ten Mile Bay	45 17 04	78 58 04	98010010401	31E7
IB5	Bigwin Is.	45 15 03	79 01 00	98010010501	31E6
IB6	Haystack Bay	45 17 04	79 01 05	98010010601	31E6
IB7	Dwight Bay	45 19 05	79 00 09	98010010701	31E6
IB8	Portage Bay	45 18 07	79 04 02	98010010801	31E6
IB9	Seagull Rk.	45 16 05	79 03 09	98010010901	31E6
IB10	Roothog Is.	45 13 03	79 03 06	98010011001	31E3
IB11	Whitehouse Bay	45 13 06	79 05 07	98010011101	31E3
IB12	Whiskey Bay	45 12 05	79 06 00	98010011201	31E3
IB13	Burnt Is.	45 11 00	79 06 00	98010011301	31E3

Table 9. Cont'd

Field ID	Description	UTM coordinates Northing	Easting	Station code	Topographic Map
Lake Nipissing					
IG1	Yellek Point	615000	5130400	98010050101	31L6
IG2	Beaucage Point	607300	5132800	98010050201	31L5
IG3	Meadowside	595600	5133000	98010050301	31L5
IG4	Dokis Point	586300	5127100	98010050401	31L5
IG5	Mouseau Point	582900	5130000	98010050501	31L5
IG6	Sturgeon River Chl.	579000	5129000	98010050601	31L5
IG7	Cache Bay	576600	5134700	98010050701	41I8
IG8	Manitou Isl. East	613000	5125000	98010050801	31L5
IG9	Callander Bay	576800	5133400	98010050901	31L3
IG10	Second Rocky Point	616300	5121900	98010051001	31L6
IG11	North Bay Diffuser	616000	5128000	98010051101	31L6
IG12	Cambell's Point	593400	5118000	98010051201	31L4
IG13	Cross Point	598200	5118700	98010051301	31L4
IG14	Jessops Isl. West	609400	5110000	98010051401	31L4
IG15	South Bay Durrell Pt.	605800	5115800	98010051501	31L4
IG16	Hardwood Island. North	568800	5115800	98010051601	41I8
IG17	Gull Isl.East	564700	5121100	98010051701	41I8
IG18	Hay Narrows	570000	5121200	98010051801	41I1
IG19	West Bay	564800	5121000	98010051901	41I1
IG20	Little Oak Isl. South	575200	5125700	98010052001	41I8
IG21	Iron Islnd West	580000	5125100	98010052101	31L5
IG22	Iron Island East	589000	5124000	98010052201	31L5
IG23	Manitou Island West	603400	5123000	98010052301	31L5
IG24	Burritt Island South	598900	5125900	98010052401	31L5
IG25	Chaudier Dam	577000	5108000	98010052501	41I1
IG26	Little Chaudier Dam	576400	5110400	98010052601	41I1
Rice and Sturgeon Lakes					
BYN	Bewdley North at Hwy 28, North of Bewdley, Ont.			17002153502	31D1
BYS	Bewdley South at C.R.9, South of Bewdley, Ont.			17002153602	31D1
IR1	Indian River at C.R.2, Keene Ont.			17002100602	31D8
OE1	Ouse River at C.R.2, Birdsalls, Ont.			17002112002	31D8
OT1	Otonabee River at Cambellville, Ont.			17002161302	31D1
TT1	Trent River at Hwy 45, Hastings, Ont.			17002107602	31C5
RE33	Rice Lake near Bewdley			17002153701	31D1
RE34	Rice Lake near Spook Island			17002153801	31D1
RE35	Rice Lake near Hickory Island			17002153901	31D1
RE36	Rice Lake near Margaret Island			17002154001	31D8
ML1	McLaren Creek at 1st Conc. upstream of Hwy. 35			17002112402	31D7
RD1	Rutherford Creek at C.R.10			17002112502	31D7
HK1	Hawkers Creek at C.R.8			17002112302	31D10
MN1	Martin Creek at C.R.8			17002112202	31D10
EY1	Emily Creek at Hwy. 36			17002112102	31D7
CA1	Cameron Lake Outflow at Hwy. 121, Fenelon Falls			17002102302	31D10
SG1	Scugog River at Lock 33, Lindsay			17002161702	31D7
SG2	Scugog River at old Railway Bridge, Lindsay			17002161202	31D7
BB1	Sturgeon Lake Outflow at Hwy. 36, Bobcaygeon			17002102102	31D10
SN6	Sturgeon Lake near Buoy C559			17002154101	31D10
SN7	Sturgeon Lake mid-lake near Snug Harbour			17002154201	31D7
SN8	Sturgeon Lake near Bouy CP45			17002154301	31D7
SN9	Sturgeon Lake off Sturgeon Point			17002154401	31D7
SN10	Sturgeon Lake mid-lake near Thurstonia Park			17002154501	31D7
SN11	Sturgeon Lake near Bouy C590			17002154601	31D10

7. BIOLOGICAL SAMPLING METHODS

7.1. Light, Phytoplankton, Chlorophyll

From 1976-2006, the euphotic zone was estimated as twice the Secchi disc depth. The biological sampling methods throughout this period are described in Scheider et al. (1983). All phytoplankton samples were volumetrically combined, stabilized with 1 - 3 ml of Lugol's solution and shipped to the Taxonomy Section of the Ministry of the Environment Rexdale Lab for processing (concentration by sedimentation and preservation with formalin) and analysis. The formula for the Lugol's iodine solution is 50 grams of Iodine plus 100 grams of Potassium Iodide mixed with 1 litre of distilled water. This solution was then stored in a fume hood and inside an amber or opaque glass bottle. The phytoplankton analysis methods described in Nicholls and Carney (1979), Nicholls et al. (1992) and Hopkins and Standke (1992) included use of inverted microscopes and the Utermohl method (Utermohl 1958). In the Utermohl technique, subsamples of the concentrated samples were settled into 2.1 or 5.0 ml Utermohl -type plankton counting chambers. At least one half of the chamber was scanned at 150 x for larger phytoplankters. One to several radii were examined at 600x for smaller forms. Between 200 and 400 "units" (cells, filaments or colonies) were counted for each sample, a number that Lund et al. (1958) considered to provide acceptable precision. Dimensions of all counted cells (excluding gelatinous envelopes and chrysophyte loricae) were recorded and volumes computed by calculating volumes of most similar geometric shapes. Volumetric data were converted to biomass (as wet weight) assuming unit density.

The chlorophyll samples were collected from the same volumetrically combined sample and poured off into a 1 litre opaque brown nalgene bottle and temporarily stabilized with 5 drops of a 20 g/L $MgCO_3$ solution. A measured volume (500-1000 ml) was vacuum (5-10 psi) filtered through a 1.2 µm Sartorius or Millipore filter paper. The filters were then frozen in aluminum foil covered petri dishes and sent to the Rexdale Lab for analysis.

Beginning May 1982, a profile of photosynthetically available radiation (PAR) was recorded on selected lakes. An "in-water" surface reference, a down-welling and an up-welling radiation component was measured ($\mu ES^{-1}m^{-2}$). The three cosine-corrected model LI-2 SB flat sensors were attached to a model SS-3 selector by means of sensor specific Calconnectors. The Calconnectors contain calibration potentiometers (variable resistance) for direct readout, which has accounted for the immersion effect of underwater readings. The sensor selector was then

attached to a model LI 188B Integrating Quantum Radiometer Photometer. The “in-water” reference sensor was kept in a constant position, immersed in the lake and receiving solar radiation. The two profile sensors were permanently fastened on a model LI-2009S lowering frame directing the sensors in opposing direction on a vertical axis. Measurements were integrated for 10 seconds on the three sensors at each interval of the profile. The profile increment was constructed so that a minimum of seven intervals were measured. In lakes of shallow depth or inhibited light penetration (either for reasons of turbidity or colour) the profile increment was set at half-metre intervals from 0.05m or Just Below Surface (JBS), to the depth where 1% of the JBS down-welling light level was measured. In lakes of deep light penetration, the increment was set at JBS, 0.5m, 1.0m, 2.0m, and alternating metres 4, 6, 8, etc. thereafter until the depth where 1% of JBS light was measured. Supplementary intervals were added on occasions where euphotic sample depth (2 X Secchi disc) exceeded that of 1% of the JBS light measurement. The 1% of JBS was derived from a measurement of down-welling at a depth with a corresponding reference value to that of the initial JBS (0.05m) measurement. In the event of changing light at the reference sensor, all other measurements were correspondingly corrected. When the euphotic zone derived from the calculation of twice the Secchi disc depth differed from that of 1% of JBS light on Chub, Plastic and Red Chalk Lake (main basin) in 1983 -85, separate collections were made for each euphotic zone as described in Locke and Scott (1986).

The measuring of photosynthetically available radiation (PAR) was discontinued at the end of the ice-free period of 1985 and resumed in August 1997 to 2006. From the 1984 ice-free season, to the present date, the euphotic zone was estimated as twice the Secchi disc depth. During the ice cover period the euphotic zone has continued to be uniformly estimated as the upper 6 m in all study lakes.

The parameter CHLRBT (chlorophyll b) was deleted from "requests for analysis" from August 1986 to present in all study lakes.

7.2. Zooplankton (1976-2006)

The goal of the zooplankton sampling program is to describe long-term changes in crustacean zooplankton size and taxonomic composition, principally at annual time steps. For this purpose, the contribution of the horizontal component of variability may be ignored (Yan 1986). Gear and counting protocol must be invariant, and temporal and vertical sources of

variance must be incorporated into the sampling design.

Zooplankton samples were collected during the ice free season with frequencies indicated in Table 10. Routine zooplankton collection was performed using a DRC zooplankton net (Yan et al. 1992). This was constructed from the 12.2 cm diameter propeller style flow meter housing (Wildco Wildlife Supply Co. Catalogue # 39), to which an 80 μm polyester mesh, 75 cm long conical tow net was attached. The net length was increased to 138.43 cm effective June 1999 in an effort to improve the filtration area and subsequently efficiency. The propeller was outfitted with a rotary ratchet drive, flange case, uni-directional counter (model 746125 001 YP07M, Veeder-Root Co., Digital System Division). The net was outfitted with a Wildco Model 40B plankton bucket equipped with 80 μm polyester mesh.

From 1978 to 1980, sample volumes were calculated using a conversion factor of 5.6 L of lake water filtered per reading on the counter (Hitchin and Yan 1983). This value (5.6) was supplied by Dr. C. Bil of the National Water Research Institute in Burlington, Ontario after calibrating the DRC zooplankton sampler (Locke and Scott, 1986). After 1980 volumes were determined from counter readings of the collection and calibration (with no net) hauls as described by Locke and Scott (1986) in which filtration efficiencies and sample volumes were determined as follows:

If: Sum C = Sum of counter revolutions for all non-calibrated hauls

Sum T = The total length (m) of all non-calibrated hauls

Tow L = The length (m) of the longest haul

Won C = Counter revolutions for the single calibration haul

assumed to have length = Tow L

then, the filtration efficiency (EF in %) is defined by

EF = 100 x (Sum C/Sum T) x (Tow L/ Won C)

If the meter counts per unit length are identical in the calibration and non-calibration hauls, then EF = 100%

If ^{A}net = area of the mouth of the DRC plankton sampler = (πr^2) = $(3.14 \times 6.1^2) = 117 \times 10^{-4}$ m^2

The volume of lake water from which organisms were collected (VL in litres)

VL = ^{A}net x Sum T x EF

After equalization of dimensions, substitution of the EF value from equation 1 and

simplification, this reduces to the working formula used, namely,

VL = (11.7 x Sum C) x (Tow L / Won C)

The major difference between the new and the old methods for calculating VL was the assumption of unvarying meter performance in the old method. The DRC net retainer ring adapted to the meter housing has been found to affect the propeller performance. Several tests in June of 1998 were performed in lakes Dickie, Plastic and Harp, in which the probability of a significant difference between the two treatments (with and without the retainer ring) was P=0.06; hence the retainer ring is left on for the no-net hauls. Resetting the position of the retainer ring is intended to approximate the with-net hauls points of pressure on the meter housing. It is imperative that the retainer ring adjusting screw be set at a point adjacent to the cross member that bisects the diameter of the counting barrel. This action produces the least barrel wharpage and functions as an attachment standard.

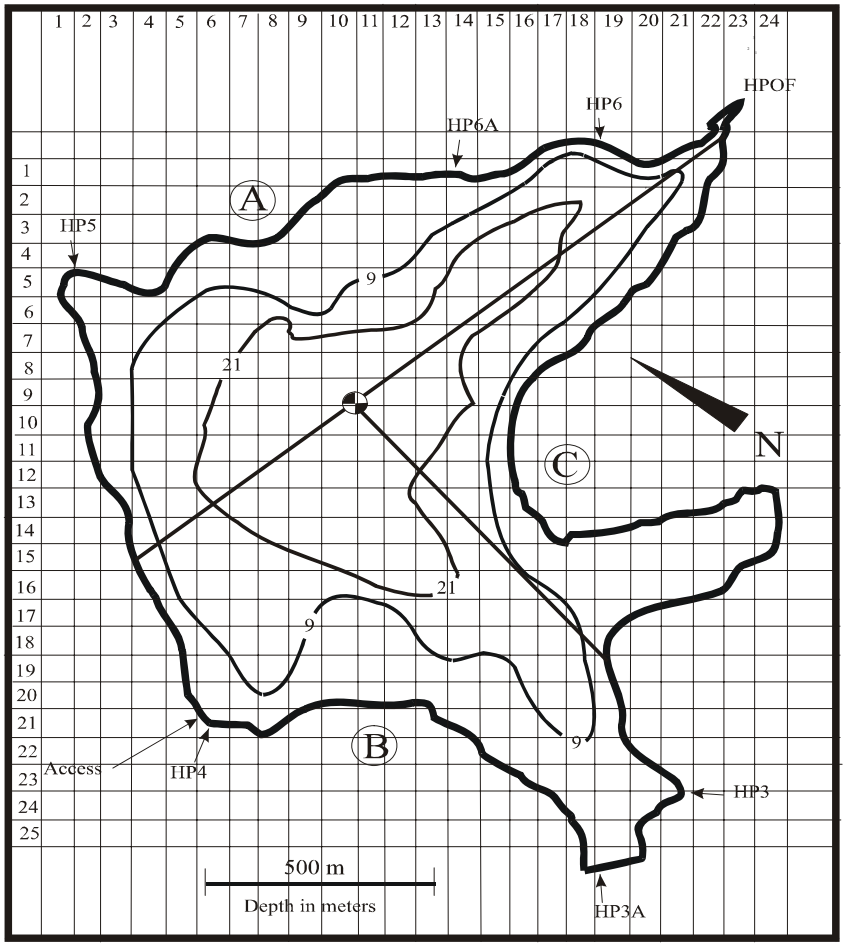
Yan and Welbourn (1990) showed that adequate averages of zooplankton biomass and species richness of Dorset lakes could be determined from samples collected on a monthly basis during the ice-free season. Hence samples are routinely collected on a monthly basis in most lakes. In Harp and Plastic lakes, we wished to evaluate seasonal patterns and samples are collected biweekly. To allow for the vertical variation in zooplankton composition and for the diminution of stratum volume with lake depths, composite samples were formed by combining the contents of a series (generally 4 to 7) of vertical net hauls (Table 11). Haul lengths were determined to minimize the deviation of the cumulative fraction of the total haul lengths from the fraction of the total lake volume that were between increments of depth. In other words, a composite sample was formed that corrected for the diminution of lake volume with depth.

Special Sampling for *Bythotrephes longimanus* (Leydig, 1860)

Additional zooplankton research was initiated in Harp Lake following the 1992 invasion of the large predatory cladoceran *Bythotrephes longimanus* (see Yan and Pawson 1997). Sampling at Harp Lake is done on a monthly basis from May to October, at 9 randomly chosen sites and at the deep station. Using the Stratified Random Sampling Design, Harp Lake is divided into 3 lake regions (A, B, C) and 3 depth zones (see Figure 1). There must be 3 sample sites in each region and 1 sample site in each depth zone. The depth zones are 1 (0 to 9m), 2 (9 to 21m) and 3 (21m to bottom). A 26 square by 26 square grid is copied onto the map of Harp

Lake. Random pairs of numbers between 1 and 26 are generated using the Microsoft Excel "Rand function (=RAND()*(26-1)+1)). From this list of numbers, the first 9 pairs that meet the aforementioned criteria (1 pair for each of 3 depth zones per region) are used to determine sample locations. The collector net has a 0.75m opening with a 3m length and 285 μm mesh. Sample depths are therefore the maximum depth less 3m in order to accommodate the net length. The depth at each sample location is determined through the use of a hand-held digital sonar. The net is lowered and held at the desired depth for 30 seconds and then raise a rate of 1m /sec. Sample volumes are mixed 50:50 in pre-labelled 500 ml PET bottles with 11% sugar formalin for a 5.5% formalin preserved sample.

Figure 1. Master Zone Map for the Stratified Random Sampling Design of Harp Lake.



Sample Preservation

Zooplankton samples were preserved in a sugar formalin solution which was titrated to a pH of 7.0 using 0.5N NaOH. The following ingredients resulted in an 11 % formalin solution:

5.0 Litres distilled water,

359.92 grams of sucrose, 620 ml Formaldehyde (full strength 37%),

43 drops of 0.5N NaOH

The preservative is mixed with the sample volume in a 50:50 proportion to achieve a 5.5 % preserved solution.

Sample Enumeration

Zooplankton species were routinely identified and enumerated by Dr. W. Geiling or Dee Geiling of Limnoservices Inc. (1980-2004). Therefore, the data were not influenced by changes in the taxonomic skills of the sample enumerators. Edmundson (1959) was the basic taxonomic reference. However, the Geilings followed Brooks (1957) as modified by Dodson (1981), Hebert & Finston (1997) and Taylor et al. (1998) for *Daphnia* spp., Korinek (1981) for *Diaphanosoma* spp., Lieder (1983), De Melo & Hebert (1994) and Taylor et al. 2002 for bosminids, and Dussart and Fernando (1990) and Hudson et al. (1998) for cyclopoid copepods. Immature copepods were routinely identified to the level of suborder, except for the large calanoids *Epischura lacustris*, *Senecella calanoides* and *Leptodiatomus sicilis*. Their copepodids were identified to the species level using Bayly (1992). *Chaoborus* species were identified using Saether (1972), and rotifers using Nogrady et al. (1993) and Segers (1995). The nonindigenous (NIS) *Bythotrephes longimanus* was identified using Rivier (1998) and Martin and Cash-Clark (1995). All applicable zooplankton taxonomic references are presented in the sections titled "General taxonomic references for zooplankton" and "Specialized zooplankton references"

An overall taxonomic guide by Witty (2004) has been compiled as a summary of current general knowledge as it specifically relates to local freshwater crustacean zooplankton found within the Sudbury Region. This guide has increasingly served as the precursor text to zooplankton studies performed by university collaborators based out of the Cooperative Freshwater Ecology Unit, Department of Biology, Laurentian University and the Dorset Environmental Science Centre. Lynne Witty is the Aquatic Invertebrate Taxonomist who has

performed the routine identification and enumeration of the Dorset and Sudbury zooplankton samples (2004 - 2006).

A minimum of 250 animals (and rarely more than 300) were enumerated and simultaneously measured in each sample. Samples were processed using a semi-automated zooplankton sample counting system called ZEBRA (Allen et al. 1993). Sub-sample volumes were adjusted for the abundance of species so that the most common species rarely formed > 20% of the total count. Individual weights were calculated from measured lengths using length-weight regressions equations derived from various sources (Table 12). All data were maintained in the database initially described by Pawson and Yan (1993). The Environmental Monitoring and Reporting Branch currently maintains the zooplankton database that is presently termed the EMRB_ZooDB2000 database. These data are made readily available as a Microsoft Access Application in Access 2000 file format.

Zooplankton Identification and enumeration: a working example

Descriptions of all count protocols used within the EMRB_Zoodb database are presented in the database table entitled Z_CODE, under the parameter "CNT_PRTCL_CODE".

CNT_PRTCL_CODE **R15** Description and methodology:

Count Protocol Description: R15 = 250 animals, <50 per taxa, <30 copepodid, < 30 nauplii, counting and distinguishing eggs as to sum and type (degenerate, free in counting cell, parthenogenic, or resting).

Methodology:

The total of 250 animals is an approximation and is intended to terminate a count within a sample, wherein the sample volume may not be entirely analyzed. The R15 protocol indicates a limit approximation of <50 per taxa. The copepodid stage of a species has a <30 taxa limit extended across the C1 to C5 phases. The count of <50 per taxa must be the total count of a specific taxa from within a known split sample volume. The taxonomist must select the dominant species from within a sample and attempt to split the sample in a horizontally level Folsom plankton splitter in such a manner as to allow a total count of the individual taxa.

Example (1a): SPP_ID 204 *Leptodiaptomus minutus*, initial sample volume 70.2 litres. By splitting the sample once and "flipping a coin" heads for the left splitting tray, tails the right tray, one can randomly select the next tray to split or analyze. The tray which is not chosen to be

split is thoroughly rinsed onto an 80μ filter and the sample portion is then rinsed into prelabeled containers which identify fraction size (ie. 1/2 or 0.5). These temporary containers are retained for analysis of rare species. A second split and subsequent random splits are performed until the taxonomist thinks that the target species approximates 50 individuals. Each split requires thorough rinsing and a secondary prelabeled container for the unused fraction.

In the event that 4 splits were performed (therefore a fraction of 1/16th or 0.0625) a numeric value of **0.0625** should be indicated as the fraction analyzed in Zebra2M for the SPP_ID 204. The total number of individuals of a taxa in this fraction are counted and the actual density (#/ m^3) within the sample volume of **70.2** litres is calculated in Zebra2M. If **49** individuals are counted in the 0.0625 fraction then:

density = (1.0/0.0625) X 49 = 784 individuals **per 70.2 litres**

density (#/m^3) = (1.0/0.0625)X49 = 784

784 / 0.0702 = **11,168.09 /m^3**

where (70.2 / 1000) = 0.0702 converting number per litre to number per cubic metre

Therefore two conversions (1) sample fraction multiplier (1.0/0.0625) and (2) converting litres to m^3 (70.2 / 1000)

Example (1b): In the event that fewer than 50 animals were counted in the split, then an additional split volume is analyzed. The first count may have been 32 individuals. The other half of the last split volume is still available. If this were split one more time, there exists the possibility that a count of 16 individuals may be found, bringing the total close to an acceptable number (48 is close to 50).

The fraction analyzed in Zebra2M must account for the first fraction (0.0625) plus the second (0.03125 or 1/32nd), therefore a total fraction of 0.09375

If 17 individuals were found, then the total is (32+17) 49 from the two fractions.

density = (1.0/0.09375) X 49 = 522.67 individuals **per 70.2 litres**

density (#/ m^3) = $\frac{(1.0 / 0.09375) \text{ X } 49}{(70.2 / 1000)} = \frac{522.67}{0.0702}$ = **7,445.44/m^3**

The taxonomic resolution of the EMRB_Zoodb database is updated on an ongoing basis (see Appendix 4). The updates have included (1) non-indigenous species (NIS), (2) published

revisions based on genetic results which reassigned genera, subgenera, species or new species, and (3) published revisions to morphological character schemes which were reconciled with the genetic data. Citation details regarding these changes are presented in the Z_NOMENCLATURE table within the database (see Appendix 4). All contributors to the EMRB_Zoodb database are provided nomenclature updates on an ongoing basis. These updates include citation, revised species identification numbers (SPP_ID), and associated length-weight regressions equations derived from various sources. The information presented in Appendix 4 is intended to chronicle the changes which occurred in the species names and species codes throughout the early development of the Zebra2M system and the database. The secondary objective of this summary is to present the documentation that supports the changes implemented in the zooplankton nomenclature. The taxonomic revision summary begins with the published data report by Hitchin and Yan (1983) followed by Pawson and Yan (1997), which reflect both historical nomenclature and species abbreviations inconsistent with the current EMRB_Zoodb. The most recently published complete species list for the EMRB_Zoodb is presented in Appendix 4.

Table 10. Number of crustacean zooplankton samples collected each year 1976 - 2006

Lake	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Blue Chalk	6	23	20	21	16	20	14	13	13	13	8	7	6	5	7	8	7	6	5	6	5	6	7	7	6	6	6	6	11	5	7
Chub	10	26	24	23	15	21	14	14	14	12	9	8	7	7	8	8	7	6	5	6	5	6	7	7	6	6	6	5	11	6	7
Crosson	2	5	6	5	16	17	15	14	13	14	11	12	13	13	12	7	7	7	5	6	5	6	7	7	6	6	6	5	5	6	7
Dickie	5	25	27	22	16	18	15	13	12	13	7	7	6	8	8	8	7	7	5	6	5	6	13	14	13	13	11	11	16	11	11
Harp	6	27	21	21	13	21	15	12	13	14	11	11	12	12	29	14	12	7	5	6	5	6	13	14	13	13	11	11	11	11	11
Heney					15	12	-*	14	12	13	13	19*	12	13	13	9	7	11	10	15	5	6	7	7	6	6	6	5	5	6	7
Mouse (Moose)																16	21	18	11	6	5	7									
Jerry	7	26	23	16																											
Plastic					16	19	14	14	13	14	12	12	30	13	27	15	12	6	5	5	5	6	13	14	13	13	11	12	12	11	11
Ranger (Sand)																16	27	19	16	6	5	7									
Red Chalk Main	6	25	24	20	17	20	15	12	13	14	8	6	6	5	7	8	7	6	5	6	5	6	7	7	6	6	6	6	6	6	7
Red Chalk East		23	22	22				13	13	13	8	7	6	5	7	8	7	6	5	6	5	6	7	7	6	6	6	6	6	6	7
Ridout																												5	5	5	7
Basshaunt			7	5	1	4	5	4	5	6																			6		
Bigwind	2	4	6	5	2	5	7	5	6	7				1															5		
Buck	2	4	7	4	1	4	6	5	6	6				1															6		
Glen			6	4	1	5	5	5	5	6																			6		
Gullfeather	2	3	7	5	2	4	8	5	7	7				1																	
Little Clear	1	4	9	4	1	4	6	5	6	6				1															6		
Solitaire		4	7	4	1	4	7	5	6	6				1															6		
Walker	1	4	7	4	1	3	6	4	6	6				1															6		
Axe						4	2																							6	
Brandy						3	3	3	5																				6		
Cinder - West						4		3	5																					2	
Cinder - East									6																					3	
Devine																													6		
Fawn						4	2	3	4																				6		
Healey						5		3	4																				6		
Leonard						4	3	3	5																				6		
Leech						5		3	4																				6		
Moot						4		3	5																				6		
McKay						4	3	3	5																				6		
Poker West						4		3	5																						
Poker East									4																						
Red Pine						5	3																							5	
Saw																													6		

* Sampled on a bi-weekly basis by Schindler/Patalas (S/P) trap, all others by DRC plankton tow net

** Collected with a Wisconsin net (1986) and a DRC net (1987, 1988) through a vertical column starting approx. 1m off the bottom

Table 10 cont'd Number of crustacean zooplankton samples collected each year (1980 - 2006

Lake	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Algonquin Lakes																											
Big Porcupine				5	7	6																				4	
Bonnechere				5	7	6																				5	
Clear		4	6	5	6	6				7	7	5	3	2	1											4	
Crown				8	7	6																			6		
Delano			5	5	7	6				6	6	5	3													5	
Kimball				6	7	6																			4		
Louisa		7	7	5	5	6																				5	
Nunikani				4	7	6																				4	
Sherborne			4	5	7	6																				6	
Smoke		7	7	6	6	6																				5	
Tim			4																								
Timberwolf			7	6	7	6																				5	
Westward		7	6	7	7	6				6	6	5	3	2	1										6		
Sudbury Lakes																											
Clearwater		6	6	6	8	6	6	6	7	5	6	7	2	5	4	6	5	5	5	5	6	6	6	6	6	6	6
Hannah		6	6	5	8	6	6	6	7	5	7	6	2	5	4	5	5	5	5	5	6	6	6	6	6	6	6
Lohi		6	6	6	8	6	6	6	7	5	6	6	2	5	4	5	5	5	5	5	6	6	6	6	6	6	6
Middle		6	7	6	8	6	6	6	7	5	7	6	2	5	4	5	5	5	5	5	6	6	6	6	6	6	6
Bat								6	6	6	6	4	3												5		
Clara								6	6	6	6	4	2														
Cradle								6	6	6	6	5	1														
Crystal								6	6	7	6	4	2														
Drummer								6	6	5	6	4	1														
Hamer											6	3	3												6		
Little Eastend								6	6	6	6	4	2														
Little Whetstone								6	6	6	4	2															
Louck's								6	6	7	6	3	2														
Maggie								6	6	7	6	4	2														
Pearceley									6	6	6	5	3														
Pincher								6	6	6	6	5	2														
Round								6	6	7	6	3	3														
Shoelace								6	6	7	6	4	1														
Skidway								6	6	7	6	4	2														
Sunset								6	6	6	6	4	2														
Windfall									6	6	6	4	2														
Young											6	4	3												6		
Rice **							9	13	14																		
Sturgeon **							7	9	9																		

* Sampled on a bi-weekly basis by Schindler/Patalas (S/P) trap, all others by DRC plankton townet

** Collected with a Wisconsin net (1986) and a DRC net (1987, 1988) through a vertical column starting approx. 1m off the bottom

Table 11. Lengths of vertical hauls combined to form composite zooplankton samples in the study lakes after May 1978. Number of hauls per sample varies from 1 to 7.

	Length (m) of Individual Hauls						
Lake	1	2	3	4	5	6	7
A Lakes							
Blue Chalk	20	15	9	4	4		
Chub	20	15	9	4	4		
Crosson	19	14	9	4	4		
Dickie	8	6	4	2			
Harp	30	21	13	6	6		
Heney	5	4	2	2			
Jerry	24	18	12	6			
Mouse	8	6	4	2			
Plastic	15	11	7	3			
Ranger	12	9	7	5	4	2	
Red Chalk-Main	32	24	16	8			
Red Chalk-East	15	11	7	3			
Ridout	14	9	4	4			
B Lakes							
Basshaunt	19	14	9	4	4		
Bigwind	25	18	11	5	5		
Buck	20	15	10	5			
Glen	12	9	6	3			
Gullfeather	8	6	4	2			
Little Clear	12	9	6	3			
Solitaire	27	20	13	6	6		
Walker	10	7	4.5	2	2		
C Lakes							
Axe	12						
Brandy	4	4					
Cinder - East	18.5	9.5	5.75	3.75	3	2	
Cinder - West	8.5	6.5	4.75	4	1.5		
Devine	7.5	6	4	2			
Fawn	6.5	2.75	2				
Healey	5.5	4	3	1.75	1		
Leech	11.5	9.5	6.75	4.75	4	1.5	
Leonard	15	10	5				
Moot	4.75	4	2	1			
McKay	10.5	5.5	3.75	1.5			
Poker - East	15.5	9.5	5.8	3.8	1.5		
Poker - West	11.5	7.5	4.5	1.75			
Red Pine	35						
Saw	10	7	4.5	2	2		
Algonquin Lakes							
Bonnechere	14.5	10.5	6.5	3.75	3	1	1
Clear	30	22	14	6	6		
Delano	15	13	8	4	4		
Louisa	50	30	16	16	8	8	
Smoke	50	30	16	16	8	8	
Tim	19	13	7	3			
Timberwolf	19	14	9	4	4		
Westward	40	30	20	10			

Note: Where station depth is less than the lowest tow net depth, take sample depth (collection) from ONE metre above bottom.

Table 11. (Cont'd)

Lake	Length (m) of Individual Hauls 1	2	3	4	5	6	7
Algonquin Lakes (cont'd)							
Big Porcupine	19.5	12.5	8.5	5.75	3.75	3	2
Crown	21.75	16.5	15	8.25	6	3	
Kimball	49	35	27	19.5	13.5	7.5	3
Nunikani	17.5	13	9.5	5	4	2	
Sherborne	23	16.5	15	9	6	3.75	3
Sudbury Lakes							
Clearwater	20	13	8	4			
Hannah	7.5	6	4	2			
Lohi	18	10	6	3			
Middle	13	10	6	3			
Sensitive Lakes							
Bat	6.5	3	2				
Clara	10	7	4.5	2	2		
Cradle	30	22	14	6	6		
Crystal	14	7	3	3			
Drummer	8	4.5	2	2			
Hamer	7	4	2				
Little Eastend	11.5	7.5	4.5	1.75			
Little Whetstone	8.5	3.5	2	1			
Louck's	7	6	4	2	2		
Maggie	25	20	12	6	6	6	
Pearceley	8.25	6.5	3.75	1.5			
Pincher	13	10	6	3			
Round	10	7	4.5	2	2		
Shoelace	10	7	4.5	2	2		
Skidway	6.5	3	2	2			
Sunset	4.5	2	1				
Windfall	9.5	4.75	4	2	1.25		
Young	20	13	7	3			

Note: Where station depth is less than the lowest tow net depth, take sample depth (collection) from ONE metre above bottom.

Table 12. Summary of parameters (a and b in $W=aL^b$) of length-weight regression equations used to estimate individual zooplankter dry weight (W in μg) from body length[1] (L in mm).

Taxon	a	b	Source[2]
Cladocera			
Acantholeberis, Acroperus, Alona, Eurycercus, Ilyocryptus, Macrothrix, Ophryoxus, Pleuroxus, Disparalona, Chydorus and Streblocerus spp.	14.08	1.98	1
Bosmina, Neobosmina and *Eubosmina* spp.	17.74	2.23	1
Ceriodaphnia, Daphnia, Latona, Scapholeberis, Sida, and Simocephalus spp.	5.0	2.84	2
Diaphanosoma spp.	5.07	1.05	1
Holopedium gibberum	11.21	3.04	3
Polyphemus pediculus	16.27	2.15	4
Calanoida			
Calanoid nauplius	3.01	1.71	1
Senecella calanoides	7.70	2.33	2
Other Calanoida	5.50	2.46	2
Cyclopoida			
Cyclopoid nauplius	2.60	1.64	1
Cyclops bicuspidatus thomasi	5.67	1.93	1
Other Cyclopoida	5.50	2.46	2
Macrozooplankton			
Bythotrephes longimanus (formerly *cederstroemi)*	8.69	3.066	5
Chaoborus punctipennis	0.638	3.794	6
Chaoborus americanus	1.425	3.599	6
Leptodora kindtii (length from mid-eye to base of bifurcation of tail spine)	0.479	2.408	7
Mysis relicta (length from tip of rostrum to the cleft of the telson)	4.69	2.72	8

1 excluding terminal spines, setae, or processes, inter-bladder length for Chaoborus

2 1 - Culver et al. (1985)
2 - Sprules et al. (1984)
3 - Calculated from Yan and Mackie (1987)
4 - McCauley (1984)
5 -Yan and Pawson (1997)
6 - Lasenby et al. (1994)
7 - Branstrator (1995)
8 Johannsson (1995)

7.3. Benthic Invertebrate Communities 1988 -2006

In 1988 the Biological Studies Unit of the Biomonitoring Section initiated a monitoring programme to assess long-term trends in benthic invertebrate communities in acid sensitive, softwater Precambrian Shield lakes. This work represents the central Ontario component of the federal-provincial Long Range Transport of Airborne Pollutants (LRTAP) programme (Shaw et al., 1992). One goal was to assess long-term trends in the composition of benthic macroinvertebrate communities in the nearshore area of the littoral zone of these lakes. A second goal of this programme was to examine temporal trends in crayfish relative abundance with reference to lake chemistry, especially lake pH (Appendix 3). The temporal series list of streams (1994 –2006) and associated lakes (1988-2006) involved are presented in Tables 13 and 14. The littoral benthos samples were either fully enumerated or counted via the rapid bioassessment technique using the same collection methods and protocol.

Table 13. Stream benthos - temporal series (1994 - 2006) Full Enumeration **FE** Rapid Bioassessment **RB**

	Year of sampling												
Stream	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**
HARP 3	FE	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
HARP 6	FE	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
PLASTIC 1	FE	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
HARP 3A	FE	FE				**RB**		**RB**					
HARP 4	FE	FE				**RB**		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
HARP 6A	FE	FE				**RB**							
RED CHALK 2	FE	FE				**RB**							
RED CHALK 3	FE	FE				**RB**		**RB**					
RED CHALK 4	FE	FE				**RB**		**RB**					
DICKIE 5	FE		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
DICKIE 6	FE	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
DICKIE 11	FE	**RB**											
CHUB 1		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
REFERENCE SERIES													
FLETCHER 1						**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
FLETCHER 3						**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
LITTLE BOSHKUNG						**RB**		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
MAPLE 1						**RB**		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
SKELETON 1							**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
TRAMWAY CREEK						**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**

Table 14. Lake benthos temporal series (1988 – 2006) Full Enumeration **FE** and Rapid Bioassessment **RB**

	Year of sampling																		
Lake	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**
BIGWIND							**RB**								**RB**	**RB**	**RB**	**RB**	**RB**
BLUE CHALK	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
CROSSON	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
HARP	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
PLASTIC	**FE**	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
HENEY		**FE**	**FE**	**FE**	**FE**	**FE**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
CLEAR	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**		**RB**			**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
HAMER	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**		**RB**			**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
WESTWARD	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**		**RB**			**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
YOUNG	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**		**RB**				**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
PEARCELEY		**FE**	**FE**	**FE**	**FE**	**RB**		**RB**			**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
CRADLE	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**							**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
DELANO	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**								**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
PINCHER	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**							**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
SKIDWAY	**FE**	**FE**	**FE**	**FE**	**FE**	**RB**													
MOUSE				**RB**	**RB**	**RB**	**RB**												
RANGER				**RB**	**RB**	**RB**	**RB**												
CHUB							**RB**		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
DICKIE							**RB**		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
RED CHALK MAIN							**RB**		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
RED CHALK EAST							**RB**		**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
RODOUT													**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**
FAIRY												**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	**RB**	

Lake and Site Selection (Littoral zone benthos)

Twelve (12) lakes were selected in 1988, from the MOE lake chemistry database to span a range of alkalinities from <-5 μeq.L^{-1} to approximately 100 μeq.L^{-1}. These lakes lie within the area bounded by Parry Sound, Gravenhurst and Algonquin Park. Six study lakes are located in the historic Lake Algonquin Basin, formed after the Wisconsin Glaciation (i.e., Blue Chalk, Crosson, Hamer, Harp, Skidway and Young lakes). The other six lie in the Algonquin/Haliburton Highlands (>340 m above sea level; i. e., Clear, Cradle, Delano, Pincher, Plastic and Westward lakes). All of the lakes are small headwater lakes (18 to 106 ha) that are located on the Precambrian Shield area of south central Ontario where sulphate deposition is high (0.75 - 1.25 g.m^{-2} .yr^{-1}; Neary and Dillon 1988).

Similarly, eight lakes were selected in 1988, from the MOE lake chemistry database to span a range of negative alkalinities (i.e., <0 μEq.L^{-1}). Hunter Lake is located in the historic Lake Algonquin Basin, formed after the Wisconsin Glaciation (335 m above sea level). The other 7 lakes lie in the Algonquin/Haliburton Highlands (>340 m above sea level; i.e., Clayton, Clyde, Doughnut, Pine, Pipio, Sugarbush and Tonakela lakes). All 8 lakes are small headwater lakes (6.9 to 53.6 ha) that are subject to the same sulphur deposition as the latter 12 moderate alkalinity lakes. A comparison of macroinvertebrate communities from these low and moderate alkalinity lakes is presented in Girard et al. (1997). In 1989 two sensitive, low alkalinity lakes were added to the 12 moderate alkalinity lakes: Heney and Pearceley lakes. Heney Lake is located in the Lake Algonquin Basin and Pearceley Lake lies within the Algonquin/Haliburton Highlands region. The data for the combined 14 lakes are presented in the summary of the first two years Reid et al. (1997a). The first five years data on the initial 12 lakes are summarized in Reid et al. (1997b).

In an initial survey, the field crew circumnavigated each lake and recorded the relative frequencies of various substrate types between the shore and a depth of approximately 1 m. Five sites were selected to include the predominant substrates: typically bedrock (BDR) and boulders (BOU), cobble (COB), pebble (PEB), silt (SLT) and/or coarse sand (CSD) with macrophytes, plus highly organic detritus and woody debris (LOS). The sites were chosen and sampled in the spring of 1988 (Reid et al. 1994a). They were re-sampled in the fall of 1988 (Reid et al. 1994b) and in five cases in the fall of each year through to 1999 for temporal analysis. Additionally a

spatial series of 51 lakes and 8 wetlands (Table 15) were extended over nine tertiary watersheds and include three bedrock geological settings of central Ontario. As a result, the aquatic characteristics involved both hardwater and softwater ecology of the Great Lakes - St. Lawrence drainage basin. A detailed summary of the substrate data associated with this spatial survey is presented in Girard et al. (2002).

Table 15. Lake benthos spatial reference series (1988 - 2006)

	Year of sampling																		
Location	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**
Bigwind							**1**								**1**	**1**	**1**	**1**	**1**
Blue Chalk	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Chub							**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Clear [142]	**1**	**1**	**1**	**1**	**1**	**1**		**1**			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Cradle	**1**	**1**	**1**	**1**	**1**	**1**							**1**	**1**	**1**	**1**	**1**	**1**	**1**
Crosson	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Delano	**1**	**1**	**1**	**1**	**1**	**1**								**1**	**1**	**1**	**1**	**1**	**1**
Dickie							**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Hamer	**1**	**1**	**1**	**1**	**1**	**1**		**1**			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Harp	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Heney		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Pearceley		**1**	**1**	**1**	**1**	**1**		**1**			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Pincher	**1**	**1**	**1**	**1**	**1**	**1**							**1**	**1**	**1**	**1**	**1**	**1**	**1**
Plastic	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Red Chalk East							**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Red Chalk Main							**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Ridout							**1**						**1**		**1**	**1**	**1**	**1**	**1**
Westward	**1**	**1**	**1**	**1**	**1**	**1**		**1**			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Young	**1**	**1**	**1**	**1**	**1**	**1**		**1**				**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Basshaunt							**1**											**1**	
Big Porcupine																		**1**	
Buck [312]								**1**										**1**	
Crown								**1**										**1**	
Kimball																		**1**	
Leech																		**1**	
Louisa							**1**											**1**	
McKay																		**1**	
Poker																		**1**	
Sherbourne								**1**										**1**	
Smoke								**1**										**1**	
Solitaire																		**1**	
Timberwolf							**1**											**1**	
Walker																		**1**	

Table 15 cont'd. Lake benthos spatial reference series (1988 - 2006)

	Year of sampling																		
Location	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**
Hunter	**1**																		
Clayton	**1**						**1**												
Clyde	**1**																		
Doughnut	**1**																		
Pine [104]	**1**																		
Pipio	**1**																		
Sugarbush	**1**																		
Tonakela	**1**																		
Balsam							**1**												
Bear [1032]								**1**											
Boshkung								**1**											
Buckhorn								**1**											
Chemung								**1**											
Clearwater							**1**												
Dickey								**1**											
Fawn [219]							**1**												
Glen								**1**											
Halls								**1**											
Hannah							**1**												
Kawagama								**1**											
Koshlong							**1**												
Leonard								**1**											
Lohi							**1**												
Meach								**1**											
Middle							**1**												
Moot							**1**												
Mouse							**1**												
Ranger							**1**												
Scugog							**1**												
Skidway						**1**													
Twelve Mile							**1**												
Wetland Study									**1996**										
Avery									**1**										
Dawson Pond									**1**										
Duck [6721]									**1**										
Rush									**1**										
Slim									**1**										
Plot 2 Pond 19 [174]									**1**										
Plot 2 Pond 9 [185]									**1**										

The sampling protocol involved a kick-and-sweep technique to collect benthos at 5 sites in the nearshore area of the littoral zone of each lake. Because of site-specific differences in

habitat complexity and sampling efficacy, we collected benthic invertebrates with a kick-and-sweep method standardized to a constant period of time rather than a standard unit of area (e.g., Okland and Okland 1979). Benthic invertebrates were collected for 10 minutes at each site along a varying number of transects (0 - 1 m depth) located 5 m apart using a standard D-frame, 250 μm mesh net. On each transect the collector waded out to a depth of 1 m. The substrate was gently kicked to disturb and dislodge the surface sediment and associated detritus. The disturbed material was swept up with the net and transferred to a plastic bucket as the collector waded slowly towards the shore (Reid et al. 1994). Additional methodological development is presented in David et al. (1997). This series of protocols describes methods for conducting rapid bioassessments in the shallow waters (i.e., <0.5 m depths) of streams and lakes. The report provides guidance regarding the time of year to sample, how to select different types of biological indices, and how to evaluate a test site with respect to regional reference values. Thus providing a simple cost-effective screening tool that can distinguish healthy sites from those sites where further investigation may be necessary. Detailed investigation of impacted areas would require the use of more intensive methods.

Laboratory Processing

The samples were sieved through 6250 and 1000 μm mesh to separate the coarse detritus and large invertebrates from the finer material. The >1000 μm fraction and any invertebrates retained by 6250 μm mesh were separately preserved in 70% ethanol. After several weeks, the sieved fraction was stained to assist in removing the remaining macroinvertebrates from debris (i.e., using a mixture of 10 g of Eosin B and 10 g Biebrich Scarlet in one litre of water at the rate of 20 mL of the resultant dye solution per 1 litre of sample). The samples were stained for two days, washed, and then sorted to remove the remaining animals. The resultant samples of benthic invertebrates were identified to the lowest practical taxonomic level. In most instances, the taxonomic resolution was to the genus or species level. Bohdan Bilyj (Biotax) identified all of the invertebrates (Reid et al.1994). General and specialized taxonomic references utilized throughout the study are presented (see General Taxonomic References for macroinvertebrates). Benthic macroinvertebrate identification included specimens listed in Table 16.

Table 16. Taxonomic and common names of benthic macroinvertebrates.

Acanthocephala	Hairworms
Coelenterata	Hydra
Nemertea	Ribbon Worms
Turbellaria	Unsegmented Flatworms
Nematoda	Unsegmented Roundworms
Annelida (Oligochaete, Hirudinae)	
Oligochaeta	Aquatic Earthworms
Hirudinea	Leeches
Crustacea (Isopoda. Amphipoda, Decapoda, Ostracoda, Copepoda)	
Isopoda	Aquatic Sow bugs
Amphipoda	Scuds, Sideswimmers
Decapoda	Crustaceans (Crayfish, Fairy, Tadpole and Clam Shrimps)
Ostracoda	Mussels, Seed Shrimps
Copepoda	Calanoids , Cyclopoids and Harpacticoids
Arthopoda	
Hydracarina	Water Mites
Collembola	semi-aquatic Springtails
Tardigrada	Water Bears
Aquatic Insects	
Ephemeroptera	Mayflies
Odonata	Dragonflies, Damselflies
Plecoptera	Stoneflies
Hemiptera	True Bugs
Megaloptera	Alderflies (Sialidae), Dobsonflies {Hellgrammites} (Corydalidae) Fishflies (Chauloides)
Neuroptera	Spongillaflies
Trichoptera	Caddis flies
Lepidoptera	Aquatic Caterpillars
Coleoptera	Water Beetles
Diptera (Flies and Midges)	
Ceratopogonidae	Flies, biting Midges
Chironomidae	nonbiting Midges
Tabanidae	Horse flies - Deer flies
Tipulidae	Crane flies
Culicidae	Mosquitoes
Simuliidae	Black flies
Chaoboridae	Phantom midge larvae
Misc (i.e. Empididae).	Leaf Miners
Mollusca (Gastropoda, Pelecypoda)	
Gastropoda	Snails, Limpets
Pelecypoda	Clams

Crayfish 1988 - 2006

Crayfish were collected with modified wire mesh minnow traps. Funnel entrances were enlarged to 3.5 cm (Collins et al. 1983) to accommodate large crayfish. In 1988 ten trap lines were set perpendicular to the shore at each of three sites. Each trap line consisted of 6 traps set at 1-m depth intervals from 1 m to 6 m. Traps were marked with 2-litre plastic bottles attached to a measured length of rope. Initially 180 traps were set in each lake with the exception of Clear, Crosson, Hamer and Skidway where fewer traps were used because of the shallow depths at one site (i.e., 4 metres) (Reid and David 1990). However, the number of traps varied (18 to 180) from 1989 to 1992 although the traps were set in a similar manner. Each lake was sampled for one night during the intermoult season of July and August from 1988 to 1992. This midsummer sampling period is the best time to estimate crayfish relative abundance because trap catches exhibit minimal seasonal variation at this time (Capelli and Magnuson 1983; Somers and Green 1993).

Data were recorded with information on lake, date, site and trap number. Crayfish were identified using the keys in Crocker and Barr (1968). Species, sex and carapace length were recorded for each crayfish. The sex of each crayfish was classified as male Form I (sexually functional male) or Form II (sexually non-functional male), or female. Dorsal carapace length was measured with vernier calipers in mm to one decimal place. Carapace length was defined as the distance between the tip of the acumen (the extreme anterior end of the rostrum) and the posterior end of the cephalothorax. The standard operating procedures for each year are presented in David et al. (1994) and summarized in Appendix 5.

The temporal series of lakes are presented in Table 17 and are studied in order to track crayfish abundance, proportions of each sex, species composition and the effects of introduced or invading species of fish (Somers et al. 2007). Historically crayfish were found in all temporal study lakes (but prior to this study crayfish were last observed in Dickie Lake in 1986, and in Plastic Lake in 1984). A 19 year temporal report for data on three species (*Cambarus bartoni*, *Orconectes propinquus*, and *O. virilis*) from 12 - 18 lakes is in prepararion (Somers et al. 2007).

A survey of 100 lakes of varying size and water quality was completed (1989 -94) to document the geographic distribution and relative abundance of crayfish species in south-central Ontario. Generally 54 traps were set for a single night in a given lake. Several lakes were re-

sampled to examine the repeatability of the resultant abundance estimates. In total, 7 crayfish species were captured (i.e., *Cambarus bartoni*, *C. robustus*, *Orconectes immunis*, *O. obscurus*, *O. propinquus*, *O. rusticus* and *O. virilis*).

The seven watersheds studied: 2CF (Georgian Bay Island Tributaries), 2EA (Georgian Bay Tributaries), 2EB (Moon Riner and Go Home River), 2EC (Severn River), 2HF (Cameron Lake Drainage), 2HG (Scugog River) and 2KD (Madawaska River) were summarized in David et al. (1997b). The latter spatial series of lakes were re-surveyed again from 2005-2007 (Table 18).

Table 17. Lake crayfish - temporal series (1988 - 2006) Crayfish CF and No Crayfish NC

	Year of Sampling																		
LAKE	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**
BIGWIND				**CF**			**CF**					**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	NC
BLUE CHALK	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
CHUB				**CF**			NC		**CF**	NC	**CF**	NC	NC	NC	**CF**	NC	**CF**	NC	**CF**
CLEAR	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	NC	NC	**CF**	**CF**
CRADLE	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**						**CF**	NC	NC	NC	**CF**	**CF**	**CF**
CROSSON	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
DELANO	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**						**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
DICKIE				NC			NC		NC	NC	NC	NC	NC	NC	**CF**	NC	NC	**CF**	NC
HAMER	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	NC	NC	**CF**	NC
HARP	**CF**	**CF**	**CF**	NC	NC	NC	NC	**CF**	NC	NC	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
HENEY			**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
PEARCELEY			**CF**	**CF**	NC	**CF**	NC	NC		**CF**	NC	**CF**	NC	NC	NC	NC	NC	NC	NC
PINCHER	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**						**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
PLASTIC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	**CF**	NC	NC	NC	NC
RED CHALK EAST		**CF**					**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
RED CHALK MAIN		**CF**					**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
RIDOUT												**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
SKIDWAY	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**						**CF**						NC
WESTWARD	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**
YOUNG	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**		**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**	**CF**

Table 18. Lake crayfish - repeated spatial series 1989-1994 and 2005-2007

(see David et al. 1997b and see Table 7a for geographic information and station codes)

Watershed Lake Name	Code	Tertiary Watershed	Elevation (mASL)	Lake Area (ha)	Lake Volume (x 10^4 m^3)	Maximum Depth (m)	Mean Depth (m)	Acid Sensitivity Rating*
2CF Georgian Bay Island Tributaries								
Clearwater	CL	2CF05	306.8	76.5	641.835	21.5	8.39	2
Lohi	LI	2CF05	303.5	40.5	251.1	19.5	6.2	1
Hannah	HH	2CF08	305.1	27.3	109.2	8.5	4.0	4
Middle	ME	2CF08	303.5	28.2	174.84	15	6.2	3
2EA Georgian Bay Tributaries								
Grundy	GY	2EA02	175.3	62.2	298.56	12.5	4.8	4
Gut	GT	2EA02	175.3	12.0	45.6	11.3	3.8	4
Bells(Silver)	BL	2EA10	312.0	42.8	286.76	13.2	6.7	3
Crawford(Otter)	CD	2EA10	279.5	93.2	270.28	6.7	2.9	3
Harris	HS	2EA10	210.3	363.4	1562.62	18.3	4.3	3
Old Mans	OM	2EA10	281.9	91.4	383.88	8.8	4.2	3
Simmons	SS	2EA10	297.2	80.0	---	3.4	---	3
Black	BK	2EA11	240.0	25.4	43.18	4.0	1.7	1
Whalley	WY	2EA12	288.9	96.5	173.7	3.4	1.8	3
Bat	BT	2EA13	245.0	36.1	75.81	4.8	2.1	3
Rock Island	RI	2EA13	201.2	144.9	840.42	13.7	5.8	3
Round 1	RD	2EA13	240.8	---	---	---	---	1
Back	BA	2EA14	220.9	19.4	---	---	---	3
Bell	BE	2EA14	214.9	57.6	241.92	8.2	4.2	3
Fairholme	FH	2EA14	266.7	66.3	344.76	23.8	5.2	3
Strathdee(Long)	LG	2EA14	336.2	31.6	101.12	6.7	3.2	3
Richmond	RN	2EA15	210.0	38.1	171.45	13.0	4.5	4
Limestone	LE	2EA16	251.8	66.7	246.79	11.6	3.7	4
Fowke(Spring)	FE	2EA17	299.0	243.0	3499.2	53.3	14.4	4
Manitouwaba	MA	2EA19	288.0	164.5	707.35	18.6	4.3	2
Mutton	MN	2EA19	225.6	45.0	81.0	5.5	1.8	3
Cheer	CH	2EA20	358.0	90.1	---	7.9	---	2
Frank	FR	2EA21	388.6	19.4	39.0	5.0	2.0	2
Clam(BigClam)	CM	2EA22	379.8	74.4	461.28	18.9	6.2	3

* ratings as designated by the Acid Sensitivity Survey of Ontario,1989:

1 - Acidic, 0 µeq/L
2 - Extremely Sensitive, 0 to 39.9 µeq/L
3 - Moderate Sensitivity, 40 to 199 µeq/L
4 - Low Sensitivity, 200 to 499 µeq/L
5 - No Sensitivity, >500 µeq/L

Table 18. cont'd. Lake crayfish - repeated spatial series 1989-1994 and 2005-2007.

(see David et al. 1997b and see Table 7a for geographic information and station codes)

Watershed		Tertiary	Elevation	Lake	Lake	Maximum	Mean	Acid
Lake Name	Code	Watershed	(mASL)	Area (ha)	Volume (x 10^4 m^3)	Depth (m)	Depth (m)	Sensitivity Rating*
2EA Georgian Bay Tributaries								
Grass(Sweny)	GS	2EA22	371.9	138.9	1541.79	36.6	11.1	2
Himbury(Rock)	HM	2EA22	342.9	53.4	320.0	14.0	6.0	3
Kernick(Pike)	KK	2EA22	341.4	44.2	322.66	22.6	7.3	2
2EB Moon River and Go Home River								
Code	CE	2EB02	205.7	---	---	---	---	2
Fogal	FL	2EB02	205.7	11.8	25.96	5.0	2.2	2
Healey 1	HY	2EB02	194.2	763.4	4351.38	22.8	5.7	2
Oldfield	OD	2EB02	205.7	20.9	---	---	---	2
Armishaw	AW	2EB07	246.9	---	---	---	---	1
Bigwind	BW	2EB09	319.0	111.0	1187.7	32.0	10.7	3
Bird	BD	2EB09	307.0	62.4	193.44	7.3	3.1	3
Chub	CB	2EB09	371.0	34.4	306.16	27.0	8.9	2
Dickie	DE	2EB09	354.5	93.6	468.0	12.0	5.0	2
Echo	EO	2EB09	332.5	209.0	961.4	11.9	4.6	3
Grandview	GV	2EB09	345.0	77.0	723.8	22.9	9.4	3
Healey 2	HE	2EB09	307.5	122.0	341.6	7.0	2.8	3
Leech	LC	2EB09	310.5	82.0	516.6	13.7	6.3	3
McKay	MY	2EB09	302.0	121.5	631.8	19.5	5.2	3
Moot	MT	2EB09	335.5	46.2	124.74	7.9	2.7	2
Ril	RL	2EB09	342.0	146.0	496.4	9.1	3.4	3
Clayton	CY	2EB12	401.0	10.0	270.0	8.0	2.7	1
Axe	AX	2EB13	317.5	264.0	660.0	15.0	2.5	2
Bittern	BN	2EB13	335.5	56.9	193.46	7.0	3.4	3
Buck	BC	2EB13	301.5	265.7	2630.43	23.5	9.9	3
Compass	CS	2EB13	335.3	48.6	126.36	7.0	2.6	3
Fawn 1	FN	2EB13	301.5	---	---	---	---	3
Fawn 2	FA	2EB13	297.0	85.8	300.3	7.9	3.5	2
Fox	FX	2EB13	294.5	136.7	779.19	12.2	5.7	3

* ratings as designated by the Acid Sensitivity Survey of Ontario,1989:

1 - Acidic, 0 µeq/L
2 - Extremely Sensitive, 0 to 39.9 µeq/L
3 - Moderate Sensitivity, 40 to 199 µeq/L
4 - Low Sensitivity, 200 to 499 µeq/L
5 - No Sensitivity, >500 µeq/L

Table 18. cont'd. Lake crayfish - repeated spatial series 1989-1994 and 2005-2007

(see David et al. 1997b and see Table 7a for geographic information and station codes)

Watershed		Tertiary	Elevation	Lake	Lake	Maximum	Mean	Acid
Lake Name	Code	Watershed	(mASL)	Area (ha)	Volume (x 10^4 m^3)	Depth (m)	Depth (m)	Sensitivity Rating*
2EB Moon River and Go Home River								
Golden City	GC	2EB13	327.7	16.1	57.96	13.9	3.6	1
Groves	GS	2EB13	327.7	22.5	---	---	---	2
Haller	HA	2EB13	326.0	13.9	54.39	9.0	3.9	3
Langford	LD	2EB13	342.9	42.1	130.51	6.7	3.1	3
Lynx	LX	2EB13	349.0	---	---	---	---	3
Rose	RS	2EB13	301.8	30.4	124.64	10.4	4.1	2
Round 2	RO	2EB13	305.5	190.4	1161.44	21.3	6.1	3
2EC Severn River								
Bentshoe	BS	2EC15	332.5	27.1	84.01	8.0	3.1	2
Big East	BI	2EC15	320.5	146.4	936.96	32.3	6.4	2
Big Orillia	BO	2EC15	319.5	45.3	231.03	11.9	5.1	3
Cinder	CI	2EC15	332.0	77.0	639.1	36.5	8.3	2
Clear	CA	2EC15	320.0	103.8	934.0	27.0	9.0	3
Grindstone	GE	2EC15	357.5	32.4	369.36	26.2	11.4	3
Gullfeather	GR	2EC15	318.0	65.9	316.32	13.0	4.8	2
Little Margaret	LM	2EC15	346.0	22.5	234.0	23.5	10.4	3
Little Orillia	LO	2EC15	327.7	25.6	89.6	6.7	3.5	3
Nehemiah	NH	2EC15	403.9	9.1	38.22	17.4	4.2	2
Red Chalk East	RE	2EC15	343.0	13.1	74.67	19.0	5.7	3
Red Chalk Main	RM	2EC15	343.0	44.1	736.47	38.0	16.7	3
Ridout	RT	2EC15	350.0	46.8	313.56	20.4	6.7	3
Saw	SW	2EC15	331.0	27.7	130.19	13.1	4.7	2
Shoe	SH	2EC15	378.0	38.6	212.3	16.8	5.5	3

* ratings as designated by the Acid Sensitivity Survey of Ontario,1989:

1 - Acidic, 0 µeq/L
2 - Extremely Sensitive, 0 to 39.9 µeq/L
3 - Moderate Sensitivity, 40 to 199 µeq/L
4 - Low Sensitivity, 200 to 499 µeq/L
5 - No Sensitivity, >500 µeq/L

Table 18. cont'd. Lake crayfish - repeated spatial series 1989-1994 and 2005-2007

(see David et al. 1997b and see Table 7a for geographic information and station codes

Watershed Lake Name	Code	Tertiary Watershed	Elevation (mASL)	Lake Area (ha)	Lake Volume (x 10^4 m^3)	Maximum Depth (m)	Mean Depth (m)	Acid Sensitivity Rating*
2HF Cameron Lake Drainage								
Balsam	BM	2HF02	256.3	4665.0	23325.0	14.9	5.0	5
Koshlong	KG	2HF06	347.0	409.0	4171.8	42.0	10.2	3
Big Hawk	BH	2HF08	359.7	388.8	7037.28	59.0	18.1	2
Boshkung	BG	2HF08	307.5	716.4	16477.2	71.0	23.0	3
Goodwin	GN	2HF08	405.4	47.6	---	---	---	2
Johnson	JN	2HF08	374.9	151.0	2778.4	45.1	18.4	2
Kabakwa	KA	2HF08	358.0	114.8	792.12	19.5	6.9	3
Kelly	KY	2HF08	374.9	98.7	2171.4	31.0	22.0	2
Kushog	KU	2HF08	332.8	640.0	6272.0	38.1	9.8	3
Lipsy	LY	2HF08	410.9	69.0	545.1	52.1	7.9	2
Little Buckhorn	LB	2HF08	405.4	23.7	111.39	16.0	4.7	2
Little Hawk	LH	2HF08	359.7	342.8	10832.5	93.0	31.6	2
Little Kennisis	LK	2HF08	369.1	229.6	3466.96	43.9	15.1	2
Lower Welch	LW	2HF08	358.0	16.0	52.8	15.5	3.3	4
Margaret	MG	2HF08	349.5	60.5	689.7	32.3	11.4	3
Red Pine	RP	2HF08	342.9	380.3	3841.03	38.7	10.1	2
Sherborne	SE	2HF08	357.0	252.0	2419.2	35.1	9.6	2
St.Nora	SN	2HF08	332.8	262.0	4192.0	39.0	16.0	3
Twelve Mile	TM	2HF08	307.5	336.8	4041.6	27.4	12.0	3
Basshaunt	BU	2HF10	403.9	47.3	364.21	24.0	7.7	3
2HG Scugog River								
Scugog	SG	2HG02	249.9	6374.0	11473.2	7.0	1.8	5
2KD Upper Madawaska River								
Timberwolf	TF	2KD13	419.0	167.0	1235.8	20.4	7.4	2
Louisa	LA	2KD19	440.4	513.0	8259.3	61.0	16.1	2

* ratings as designated by the Acid Sensitivity Survey of Ontario,1989:

1 - Acidic, 0 µeq/L
2 - Extremely Sensitive, 0 to 39.9 µeq/L
3. - Moderate Sensitivity, 40 to 199 µeq/L
4. - Low Sensitivity, 200 to 499 µeq/L
5. - No Sensitivity, >500 µeq/L

*1 - Fenelon, Bexley and Somerville twps.
*2 - Cartwright, Reach, Mariposa and Ops twps.

Fish Presence / Absence

Although fish population studies have not been part of the routine lake studies at DESC, species presence/absence has often been included in DESC reports to support conclusions relating to major study findings (David 1994; Reid et al. 1994, 1997). Fish community information has been used to identify food chain stressors on the smaller biological organisms which are routinely studied in DESC programs. The effects of predator prey relationships have been studied for indigenous, introduced and invading species of fish and associated relative changes in the biota or lake ecology. As an example, the presence or absence of several predatory species appears to correspond with differences in crayfish CUE (Collins et al. 1983; Somers and Green 1993).

The Fish ID codes and names of fish species are those presented in the Ministry of Natural Resources Aquatic Inventory Programme. Refer to Appendix 6 for the complete list of fish ID codes and names of fish species found in Ontario. The presence/absence of species may vary over time and therefore the species list in Table 19 is only intended as an historical reference. The fish information was derived from the historical Ministry of Natural Resources (MNR) Aquatic Inventory Programme and the "Fact Sheet" for the annual fish stocking list, (numbers in BOLD print) distributed at each MNR administrative area office. Additional information on fish was derived from Don Jackson (M.Sc. thesis 1988) and George Morgan (Morgan and Snucins 2005). Field identification of fish specimens was performed with the aid of the Freshwater Fishes of Canada (Scott and Crossman 1973). Table 20 is intended to serve as a historical reference in which species are described as (H) historical, (P) present in all surveys, or (N) new to the species inventory. Table 20 presents a summary of all known fish species reported in 191 lakes distributed across eight secondary watershed divisions. Lakes that have commonly repeated names are identified with a Body of Water Number presented in Table 7a which distinguishes lake location.

Table 19 Fish species names and OMNR code numbers

OMNR Code	Scientific Name	Common Name	OMNR Code	Scientific Name	Common Name
76	*Oncorhynchus mykis*	Rainbow Trout	206	*Notropis volucellus*	Mimic Shiner
78	*Salmo trutta*	Brown Trout	208	*Pimephales notatus*	Bluntnose Minnow
80	*Salvelinus fontinalis*	Brook Trout	209	*Pimephales promelas*	Fathead Minnow
81	*Salvelinus namaycush*	Lake Trout	210	*Rhinichthys atratulus*	Blacknose Dace
82	*Salvelinus namaycush x fontinalis*	Splake	212	*Semotilus atromaculatus*	Creek Chub
90	*Coregoninae*	Whitefish subfamily	213	*Semotilus corporalis*	FallFish
91	*Coregonus clupeaformis*	Lake Whitefish	214	*Semotilus margarita*	Pearl Dace
92	*Coregonus alpenae*	Longjaw Cisco	224	*Notropis sp.*	Cyprinidae
93	*Coregonus artedii*	Cisco (Lake Herring)	232	*Ictalurus natalis*	Yellow Bullhead
102	*Prosopium cylindraceum*	Round Whitefish	233	*Ictalurus nebulosus*	Brown Bullhead
121	*Osmerus mordax*	Rainbow Smelt	261	*Fundulus diaphanus*	Banded Killifish
131	*Esox lucius*	Northern Pike	271	*Lota lota*	Burbot
132	*Esox masquinongy*	Muskellunge	281	*Culaea inconstans*	Brook Stickleback
141	*Umbra limi*	Central Mudminnow	283	*Pungitius pungitius*	Ninespine Stickleback
162	*Castoromus catostomus*	Longnose Sucker	291	*Percopsis omiscomaycus*	Trout-perch
163	*Catostomus commersoni*	White Sucker	311	*Ambloplites rupestris*	Rock Bass
164	*Erimzon sucetta*	Lake Chubsucker	313	*Lepomis gibbosus*	Pumpkinseed
165	*Hypentelium nigricans*	Northern Hognose Sucker	314	*Lepomis macrochirus*	Bluegill
182	*Phoxinus eos*	Northern Redbelly Dace	316	*Micropterus dolomieui*	Smallmouth Bass
183	*Phoxinus neogaeus*	Finescale Dace	317	*Micropterus salmoides*	Largemouth Bass
184	*Clinostomus elongaeus*	Redside Dace	319	*Pomoxis nigromaculatus*	Black Crappie
185	*Couesius plumbeus*	Lake Chub	331	*Perca flavescens*	Yellow Perch
186	*Cyprinus carpio*	Common Carp	334	*Sander vitreus vitreus*	Walleye (Yellow Pickerel)
189	*Hybognathus hankinsoni*	Brassy Minnow	338	*Etheostoma exile*	Iowa Darter
194	*Notemigonus crysoleucas*	Golden Shiner	339	*Etheostoma flabellare*	Fantail Darter
196	*Notropis atherinoides*	Emerald Shiner	341	*Etheostoma nigrum*	Johnny Darter
198	*Notropis cornutus*	Common Shiner	342	*Percina caprodes*	Logperch
199	*Notropis heterodon*	Blackchin Shiner	381	*Cottus bairdi*	Mottled Sculpin
200	*Notropis heterolepis*	Blacknose Shiner	382	*Cottus cognatus*	Slimy Sculpin
201	*Notropis hudsonius*	Spottail Shiner	383	*Cuttus ricei*	Spoonhead Sculpin

Table 20: Lake fish occurrence by secondary watershed division . (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EA Georgian Bay Tributaries

	OMNR Fish Codes*																										
Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
BACK [265]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BAT [455]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BEAR [266]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
BELL [453]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BELLS (SILVER) [110]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BLACK [456]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHEER [119]	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
CLAM (BIG CLAM) [93]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
CRAWFORD [111]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
FAIRHOLME [112]	--	--	--	P	--	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
FOWKE (SPRING) [123]	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
FRANK [96]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--
GRAPHITE [97]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
GRASS (SWENY) [98]	--	--	P	P	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	--	--	--	--	P	--
GRUNDY [451]	--	--	--	--	--	--	--	--	P	--	--	P	--	P	--	P	--	--	--	--	--	--	--	--	P	--	P	--
GUT [452]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	P	--	P	--
HARRIS [457]	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
HIMBURY (ROCK) [99]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
HORN [269]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
KERNICK (PIKE) [101]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
LIMESTONE [2627]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
LITTLE WHETSTONE	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--
MANITOUWABA [273]	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
MUTTON [275]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
OLDFIELD [258]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OLD MAN [115]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	P	--
PEARCELY [108]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--
PINE [104]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RICHMOND [454]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
ROCK ISLAND [459]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
ROUND [460]	--	--	--	--	--	--	--	--	--	--	--	--	H	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
ROUND [4228]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SIMMONS [117]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
STRATHDEE (LONG) [463]	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
SUGARBUSH [416]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--
WHALLEY [417]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
WINDFALL [419]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)

Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EA Georgian Bay Tributaries

	OMNR Fish Codes*																														
Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
BACK [265]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
BAT [455]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	P	--	--	P	--	P	--	P	--	--	--	--	--	--
BEAR [266]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	P	--	P	P	--	P	P	--	--	--	--	--	--	--
BELL [453]	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	P	--	--	P	--	P	--	--	--	--	--	--	--	--
BELLS (SILVER) [110]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--
BLACK [456]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	--	--
CHEER [119]	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
CLAM (BIG CLAM) [93]	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
CRAWFORD [111]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	P	--	P	P	--	--	--	--	--	--	--
FAIRHOLME [112]	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
FOWKE (SPRING) [123]	--	P	--	P	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
FRANK [96]	P	--	--	--	--	--	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GRAPHITE [97]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GRASS (SWENY) [98]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	--	--
GRUNDY [451]	--	--	--	P	--	--	--	--	--	--	--	P	--	--	P	--	--	P	P	--	P	--	P	P	P	--	--	P	P	--	--	--
GUT [452]	P	--	--	P	--	--	--	--	--	--	--	P	--	--	P	--	--	--	P	--	--	--	--	P	P	P	--	P	--	--	--	--
HARRIS [457]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	P	--	--	--	--	--	--	--
HIMBURY (ROCK) [99]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
HORN [269]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	--	--
KERNICK (PIKE) [101]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
LIMESTONE [2627]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
LITTLE WHETSTONE [102]	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MANITOUWABA [273]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	P	--	P	--	--	--	--	--	--	--	--
MUTTON [275]	--	--	--	P	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
OLDFIELD [258]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--
OLD MAN [115]	P	--	--	--	P	--	P	--	--	--	--	--	--	--	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
PEARCELY [108]	--	--	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PINE [104]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RICHMOND [454]	--	--	--	P	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	P	P	--	P	--	P	--	--	--	--	--	--
ROCK ISLAND [459]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	P	P	P	--	P	--	--	--	--
ROUND [460]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
ROUND [4228]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
SIMMONS [117]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
STRATHDEE (LONG) [463]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	--	P	--	P	--	--	--	--	--	--	--	--
SUGARBUSH [416]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WHALLEY [417]	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	P	--	P	--	--	--	--	--	--
WINDFALL [419]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EB Moon River and Go Home River

	OMNR Fish Codes*																												
Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
ARMISHAW [240]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
AXE [284]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BEAR [1032]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
BIG PORCUPINE [310]	--	--	N	P	--	--	--	--	--	--	--	--	--	--	P	N	--	--	N	--	--	--	--	--	--	--	--	--
BIGWIND [211]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	H	--	--	--	--	--	H	--	--	--
BIRD [212]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	P	--
BITTERN [286]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
BRANDY [241]	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BUCK [312]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BUCK [287]	--	--	--	P	--	--	--	--	P	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
CHUB [137]	H	--	--	--	--	--	--	--	--	--	--	--	--	--	H	H	--	--	--	--	--	--	--	--	H	--	--	--
CLAYTON [313] ***	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	P	--	--	--	--	--	--	--	--
CODE [245]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
COMPASS [288]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
CROWN [315]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	N
DICKIE [217]	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	P	--	--	P	--	--	--	--	--	H	--	--	--
DOUGHNUT [316]	--	--	H	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECHO [218]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
FAIRY [289]	--	--	--	P	--	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
FAWN [290]	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
FAWN [219]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	P	--	P	--
FOGAL [246]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
FOX [291]	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	P	--	--	--	--	--	P	--	--	--
GO HOME [247]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	P	P	--	--
GOLDEN CITY [292]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GRANDVIEW [220]	--	--	--	P	--	--	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--
GROVES [293] **	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HALLER [294] **	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HAMER	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HARP [295]	--	--	H	P	--	--	N	H	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
HEALEY [249]	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
HEALEY [222]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	P	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EB Moon River and Go Home River

	OMNR Fish Codes*																											
Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
HENEY [223]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	H	--	--	--	--	--	--	--	--	N	--	--	--
JOHNSON [299]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
KAWAGAMA [320] ***	--	--	P	P	--	--	P	--	P	--	--	--	--	--	--	P	--	--	P	P	--	P	--	--	--	--	P	--
KIMBALL [321] ***	--	--	P	P	--	H	--	--	--	--	N	--	--	--	--	P	--	--	P	P	--	P	--	--	--	--	P	--
LAKE JOSEPH [251]	P	--	--	P	--	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
LAKE MUSKOKA [15]	P	--	P	P	--	--	P	--	P	--	P	P	--	--	P	P	--	--	--	--	--	--	--	--	P	--	--	--
LAKE OF BAYS [255]	P	--	P	P	--	--	P	--	P	--	P	--	--	--	P	P	--	--	P	--	--	--	--	--	--	--	P	--
LAKE ROSSEAU [252]	P	--	--	P	--	--	P	--	P	--	P	--	--	--	P	P	--	--	--	--	--	--	--	--	P	--	--	--
LANGFORD (LONG) [300]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
LEECH [226]	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
LEONARD [227]	P	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--
LITTLE CLEAR [301]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
LITTLE OTTER [272]	--	--	--	P	--	--	--	--	P	--	P	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
LOUCK'S [254]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LYNX [2900]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
MARY [231]	P	--	P	P	--	--	P	--	P	--	P	--	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	--
MCKAY[232]	H	--	--	--	--	--	--	--	--	--	--	N	--	--	--	P	--	--	--	--	--	--	--	--	N	--	--	--
MOOT [233]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
OLDFIELD [258]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
OTTER [276]	--	--	--	P	--	--	--	--	P	--	P	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
PENNINSULA [305]	P	--	--	P	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--
PINCHER [89]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
RIL [207]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	P	--	--
ROSE [234]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
ROUND [308]	--	--	P	--	--	--	P	--	P	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
SKELETON [236]	--	--	--	P	--	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--
SKIDWAY [262]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
SMOKE [400]	--	--	H	P	--	--	N	--	N	H	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	N	--
SOLITIARE [430]	--	--	--	P	--	--	H	--	--	N	--	--	--	--	--	P	--	--	--	--	--	N	--	--	--	--	N	--
TABOR (LAMBS) [429]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	P	--	--	--	--	--	--	--	--
THREE MILE [426]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
VERNON [432]	--	--	--	P	--	--	P	--	--	--	P	--	--	--	P	P	--	--	--	--	--	--	--	--	--	--	P	--
WALKER [418]	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	N
WESTWARD [427]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	P	--	--	--	--	H	--
YOUNG [428]	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EB Moon River and Go Home River

	OMNR Fish Codes*																														
Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
ARMISHAW [240]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
AXE [284]	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	P	--	--	--	--	--	--
BEAR [1032]	P	--	--	P	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
BIG PORCUPINE [310]	--	--	--	--	--	--	N	--	N	--	--	P	--	N	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
BIGWIND [211]	--	--	--	P	H	--	H	--	--	--	--	P	--	--	--	--	--	--	P	--	--	N	--	P	--	--	--	--	--	--	--	--
BIRD [212]	--	--	--	P	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
BITTERN [286]	P	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
BRANDY [241]	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	--	P	P	--	P	P	--	P	P	--	--	--	--	--	--	--
BUCK [312]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
BUCK [287]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	P	--	P	--	--	--	--	--	--	--	--
CHUB [137]	--	--	--	--	--	--	H	--	--	--	--	P	--	--	--	--	--	--	P	--	P	H	--	H	--	--	--	--	--	--	N	--
CLAYTON [313] ***	--	--	--	--	--	--	P	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CODE [245]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--
COMPASS [288]	--	--	--	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
CROWN [315]	--	--	--	N	--	--	P	--	--	--	--	P	--	--	H	--	--	--	N	--	N	--	--	P	--	--	--	--	--	--	--	--
DICKIE [217]	--	--	--	--	--	--	H	--	H	--	--	P	--	--	--	--	--	N	P	--	P	P	--	P	--	--	--	--	--	--	--	--
DOUGHNUT [316]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ECHO [218]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
FAIRY [289]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--
FAWN [290]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	P	--	P	--	--	--	--	--	--	--	--
FAWN [219]	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	P	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
FOGAL [246]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	--	--
FOX [291]	P	--	--	--	--	P	--	--	P	--	--	--	--	--	P	--	P	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
GO HOME [247]	--	P	P	P	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	P	P	--	P	P	P	--	P	P	--	--	--
GOLDEN CITY [292]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
GRANDVIEW [220]	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--	--	--	--
GROVES [293] **	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HALLER [294] **	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HAMER	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
HARP [295]	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--
HEALEY [249]	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
HEALEY [222]	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EB Moon River and Go Home River

	OMNR Fish Codes*																														
Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
HENEY [223]	N	--	--	N	--	--	N	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	N	--	--	--	--	--	--	--	--
JOHNSON [299]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
KAWAGAMA [320] ***	P	--	--	P	--	--	P	--	--	--	--	P	--	P	P	P	--	P	P	--	P	--	--	P	--	P	--	--	--	--	--	--
KIMBALL [321] ***	--	--	--	N	--	--	--	--	--	--	--	N	--	P	--	--	--	N	N	--	P	--	--	P	--	H	--	--	--	--	--	--
LAKE JOSEPH [251]	P	P	--	P	--	--	P	--	--	--	--	P	--	P	--	--	--	P	P	--	P	P	--	P	P	P	--	--	P	--	--	--
LAKE MUSKOKA [15]	P	P	--	P	--	--	--	--	--	--	--	P	--	P	--	--	--	P	P	--	P	P	--	P	P	P	--	--	P	--	--	--
LAKE OF BAYS [255]	P	--	--	P	P	--	P	--	P	--	--	P	--	P	P	--	P	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
LAKE ROSSEAU [252]	P	P	--	P	--	--	P	--	--	--	--	P	--	P	P	--	--	P	P	--	P	P	--	P	P	P	--	--	P	--	--	--
LANGFORD (LONG) [300]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
LEECH [226]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	N	--
LEONARD [227]	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	P	--	--	--	--	--	--	--
LITTLE CLEAR [301]	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
LITTLE OTTER [272]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	P	P	P	--	--	--	--	--	--	--	--
LOUCK'S [254]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	P	--	P	--	--	--	--	--	--	--	--
LYNX [2900]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
MARY [231]	--	--	--	P	--	--	--	--	--	--	--	P	--	P	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
MCKAY [232]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	H	P	P	--	P	N	--	P	--	--	--	--	--	--	--	--
MOOT [233]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	P	--	--	--	--	--	--	--	--	--	--
OLDFIELD [258]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--
OTTER [276]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	P	P	P	--	--	--	--	--	--	--	--
PENNINSULA [305]	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
PINCHER [89]	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RIL [207]	P	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	P	--	--	--	--	--	--	--	--
ROSE [234]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	P	--	--	--	--	--	--	--
ROUND [308]	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
SKELETON [236]	--	--	--	P	--	--	P	--	--	--	--	--	--	P	--	--	P	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--
SKIDWAY [262]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
SMOKE [400]	--	--	--	N	--	--	--	--	--	--	--	N	--	P	--	--	--	--	N	--	P	--	--	P	--	--	--	--	--	N	--	--
SOLITIARE [430]	--	--	--	--	--	--	--	--	--	--	--	H	--	P	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	N	--
TABOR (LAMBS) [429]	--	--	--	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	P	--	--	--	--	--	--	--	--	--	--
THREE MILE [426]	--	--	--	P	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	P	--	--	--	--	--	--	--
VERNON [432]	--	--	--	P	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
WALKER [418]	H	--	--	N	--	--	H	--	--	--	--	--	--	--	--	--	--	--	N	--	P	--	--	P	--	N	--	--	--	--	--	--
WESTWARD [427]	P	--	--	--	P	N	N	--	--	--	--	--	--	--	H	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--
YOUNG [428]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EC Severn River

	OMNR Fish Codes*																										
Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
BENTSHOE [129] ***	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BIG EAST [132] ***		--	P	--	P	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--
BIG ORILLIA [424] ***	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
CINDER [139] ***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	P	P	--	--	--
CLAYTON [313]***	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CLEAR [142]	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	P	--	--	P	--	--	P	--	--	--	--	P	--
CROSSON [215]***	P	--	P	N	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	H	--	--	--
GRINDSTONE [146]***	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
GULLFEATHER [221]***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
LITTLE MARGARET [329]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--
LITTLE ORILLIA [425] ***	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
MOUSE (MOOSE) [165]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
NEHEMIAH [166]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POKER LAKE W [187]***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	P	--	--	--	--	--	N	--	N	N
BLUE CHALK [134]***	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	H	--	--	--	--	H	H	--	P	P
RED CHALK E [192]***	H	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	H	H	--	--	--	P	P	--	P	--
RED CHALK M [192]***	H	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	H	--	--	--	--	P	P	--	P	--
RIDOUT [4162]***	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--
SAW [235]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
SHOE [198]***	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2EC Severn River

	OMNR Fish Codes*																														
Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
BENTSHOE [129] ***	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
BIG EAST [132] ***	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
BIG ORILLIA [424] ***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	--	--
CINDER [139] ***	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
CLAYTON [313] ***	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CLEAR [142]	--	--	--	P	P	P	P	--	P	--	--	P	--	P	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
CROSSON [215] ***	H	--	--	--	--	--	H	--	--	--	--	P	--	--	--	--	--	--	P	--	--	N	--	P	--	--	--	--	--	--	--	--
GRINDSTONE [146] ***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
GULLFEATHER [221] ***	P	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	--	--
LITTLE MARGARET [329]	P	--	--	P	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
LITTLE ORILLIA [425] ***	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	--	--
MOUSE (MOOSE) [165]	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
NEHEMIAH [166]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
POKER LAKE W [187] ***	P	--	--	--	--	--	P	--	P	N	--	N	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
BLUE CHALK [134] ***	N	--	--	N	--	--	P	--	--	--	--	P	--	P	--	--	--	--	P	--	--	N	--	N	--	--	--	--	--	--	N	N
RED CHALK E [192] ***	H	--	--	H	H	P	P	H	P	--	--	H	--	H	--	--	--	--	P	--	H	P	--	N	--	--	--	--	--	--	H	N
RED CHALK M [192] ***	H	--	--	H	H	P	P	H	P	--	--	H	--	P	--	--	--	--	P	--	H	N	--	N	--	--	--	--	--	--	H	N
RIDOUT [4162] ***	--	--	--	P	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
SAW [235]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
SHOE [198] ***	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2HF Cameron Lake Drainage

	OMNR Fish Codes*																										
Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
ART [58]	--	P	P	P	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BALSAM [8]	--	--	--	--	--	--	--	--	P	--	--	P	P	P	--	P	--	--	--	--	--	--	P	--	P	--	--	--
BASSHAUNT [59]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--	--
BAT [455]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BEECH [127]	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BIG BOTHER [6756]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	P	--	--	--
BIG HAWK [133]	--	--	P	P	--	--	P	--	--	H	--	--	--	--	H	P	--	H	--	--	--	P	--	--	--	--	--	--
BOB [21]	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
BOSHKUNG [135]	--	--	--	P	--	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
CANNING [22]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
CRANBERRY [143]	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--	P	--	--
DRAG [60]	--	P	P	P	--	--	--	--	P	--	--	--	--	--	P	P	--	--	--	P	--	--	--	--	--	--	--	--
DUCK [209]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EAGLE [210]	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EYRE [401]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	P	--
GOODWIN [317]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GRASS [144]	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
GREEN [145]	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	P	P	--	P	--
HALLS [147]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
HAVELOCK [318]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
HEAD [148]	--	--	--	--	--	--	--	P	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
HINDON [149]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
HORSESHOE [26]	--	--	--	P	P	--	P	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
JOHNSON [319]	P	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
KABAKWA [150]	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
KASHAGAWIGAMOG	--	--	--	P	--	--	P	--	P	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
KELLY [151]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	--
KOSHLONG [153]	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--
KUSHOG [153]	--	--	--	P	--	--	P	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2HF Cameron Lake Drainage

	OMNR Fish Codes*																														
Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
ART [58]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--
BALSAM [8]	--	--	--	P	P	--	P	--	--	--	--	P	--	P	P	--	P	P	P	P	P	P	--	P	P	P	P	--	P	P	--	--
BASSHAUNT [59]	--	--	--	N	--	--	H	--	N	--	--	P	--	--	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--			--
BAT [455]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	P	--	H	P	--	P	--	P	--	--	--	--	--	--
BEECH [127]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
BIG BOTHER [6756]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
BIG HAWK [133]	--	--	--	--	--	--	P	--	--	--	--	P	--	P	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	P	--	--
BOB [21]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	P	--	--
BOSHKUNG [135]	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
CANNING [22]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	P	P	--	--	P	--	--	--	--	--	--	--
CRANBERRY [143]	P	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
DRAG [60]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--	--	P	P	--	P	--	--	--	--	--	--	--	--	--	--	--
DUCK [209]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--
EAGLE [210]	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	P	--	P	--	--	P	--	--	--	--	--	--	--	--
EYRE [401]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
GOODWIN [317]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	P	--	--	--	--	--	--	--	--
GRASS [144]	--	--	--	P	--	--	--	--	--	--	--	P	--	P	--	--	--	P	P	--	P	--	--	P	P	--	--	--	--	--	--	--
GREEN [145]	P	P	--	P	P	--	P	--	--	--	--	P	--	--	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
HALLS [147]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
HAVELOCK [318]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEAD [148]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	P	P	--	--	--	--	--	--	--
HINDON [149]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	P	--	P	--	--	--	--	--	--	--	--
HORSESHOE [26]	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	P	P	--	P	--	--	--	--	--	--	--	--
JOHNSON [319]	--	--	--	P	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
KABAKWA [150]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--
KASHAGAWIGAMOG [27]	--	--	--	P	--	--	--	--	--	--	--	P	--	P	--	--	--	--	P	--	P	P	--	P	P	--	--	--	--	--	--	--
KELLY [151]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
KOSHLONG [153]	--	--	--	P	--	--	P	--	--	--	--	P	--	--	P	--	--	P	P	--	P	--	--	P	--	--	--	--	--	--	--	--
KUSHOG [153]	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2HF Cameron Lake Drainage

	OMNR Fish Codes*																											
Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
LIPSY [154]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LITTLE BOSHKUNG [155]	--	--	--	P	--	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--
LITTLE BUCKHORN [324]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
LITTLE HAWK [157]	--	--	P	P	--	--	P	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
LITTLE KENNISIS [158]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	--	--	P	--	P	--
LITTLE REDSTONE [159]	--	--	--	P	--	--	--	--	--	P	--	--	--	--	P	P	--	--	--	--	P	--	--	--	P	--	--	--
LOWER WELCH [160]	P	--	P	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
MARGARET[163]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	P	--
MACDONALD [161]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	P	--	--	--
MAPLE (NINATIGO) [162]	--	--	--	P	--	--	--	--	P	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
MARGARET [163]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	P	--
MINDEN [31]	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
MOOSE [68]	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
MOUNTAIN [33]	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
NUNIKANI [167]	--	--	N	P	--	--	--	--	--	--	--	--	--	--	P	H	--	--	--	--	--	--	--	--	P	--	--	--
OBLONG [69]	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
PINE [171]	--	--	--	--	P	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
PLASTIC [172]	--	--	H	--	--	--	--	--	--	--	P	--	--	--	--	H	--	--	H	--	--	--	--	--	H	--	--	--
RANGER (SAND) [189]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
RED PINE [193]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
REDSTONE [194]	--	--	--	P	--	--	P	--	P	P	--	--	--	--	P	P	--	--	--	--	P	--	--	--	P	--	--	--
SASKATCHEWAN [195]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--	--
SHERBORNE [197]	--	--	--	P	--	--	--	--	--	--	N	--	--	--	--	P	--	--	P	--	--	--	--	--	N	--	N	--
SILVERBUCK [200]	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SOYERS [420]	--	--	--	P	--	--	P	--	P	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
ST. NORA [421]	P	--	P	P	--	--	P	--	--	--	P	--	--	--	P	P	--	--	P	--	--	--	--	P	P	--	P	--
TWELVE MILE [423]	--	--	--	P	--	--	P	--	P	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	P	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2HF Cameron Lake Drainage

	OMNR Fish Codes*																														
Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
LIPSY [154]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
LITTLE BOSHKUNG [155]	--	P	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
LITTLE BUCKHORN [324]	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--
LITTLE HAWK [157]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
LITTLE KENNISIS [158]	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	P	P	--	--	--	--	P	--	--	--	--	--	--	--	--
LITTLE REDSTONE [159]	--	--	--	--	P	--	P	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
LOWER WELCH [160]	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--
MARGARET[163]	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
MACDONALD [161]	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
MAPLE (NINATIGO) [162]	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	P	P	--	P	--	--	--	--	--	--	--	--
MARGARET [163]	--	--	--	--	--	--	P	--	--	--	--	P	--	P	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
MINDEN [31]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MOOSE [68]	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	--	P	P	--	P	--	--	P	--	--	--	--	--	--	--	--
MOUNTAIN [33]	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
NUNIKANI [167]	--	--	--	P	--	--	H	--	--	--	--	P	--	--	--	--	--	P	P	--	P	H	--	P	--	--	--	--	--	--	--	--
OBLONG [69]	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	P	--	--	P	--	--	--	--	--	--	--	--
PINE [171]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	--	--
PLASTIC [172]	--	--	--	--	--	--	P	--	H	--	--	P	--	--	--	--	--	P	P	--	--	--	--	P	--	--	--	--	--	--	--	--
RANGER (SAND) [189]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	P	P	--	P	--	--	--	--	--	--	--	--
RED PINE [193]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
REDSTONE [194]	--	--	--	--	P	--	P	--	--	--	--	P	--	P	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
SASKATCHEWAN [195]	--	P	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	--	--	--	--	--	--	--	--
SHERBORNE [197]	--	--	--	--	--	--	P	--	--	--	--	N	--	N	--	--	--	N	P	--	N	N	--	P	--	--	--	--	--	--	--	--
SILVERBUCK [200]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SOYERS [420]	--	--	--	--	--	--	--	--	--	--	--	P	--	P	--	--	--	P	P	--	P	P	--	P	--	P	--	--	--	--	--	--
ST. NORA [421]	--	P	--	P	--	P	P	--	P	--	--	P	--	P	P	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--
TWELVE MILE [423]	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	P	--	P	P	--	P	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2CF Georgian Bay Islands

	OMNR Fish Codes*																											
Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
CAMP [672]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CLEARWATER [676]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DAISY [703]	--	--	--	--	--	--	--	--	--	--	--	N	--	H	--	N	--	--	--	--	--	--	--	--	N	--	--	--
HANNAH [681]	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--	--	H	--	--	--
JOE [481]	--		--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	--	--	--	--	--	--
LOHI [684]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
McFARLANE [711]	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	N	--	--	--	--	--	--	--	--	--	N	N	--
MIDDLE [302]	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	H	--	--	--	--	--	H	--	--	--
NELSON [515]	--	--	H	P	--	--	--	--	--	--	--	H	--	--	--	P	--	--	--	--	--	N	--	N	--	--	--	--
NEPAHWIN [714]	--	--	--	H	P	--	--	--	--	--	P	N	--	--	--	P	--	--	--	--	--	--	--	--	N	--	--	--
RAMSEY [717]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--
SANS CHAMBRE [4290]	--	--	--	--	--	--	--	--	--	--	--	--	--	H	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SILVER [694]	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	N	N	--	N	--	--	--	--	--	--
ST CHARLES [695]	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WAVY [446]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WHITSON [479]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2CF Georgian Bay Islands

	OMNR Fish Codes*																														
Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
CAMP [672]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	N	--	--	--	--	--	--
CLEARWATER [676]	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	N	--	--	N	--	--	--	--	--	--	--	--
DAISY [703]	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	N	--	--	--	--	N	N	N	--	--	--	--	--	--
HANNAH [681]	--	--	--	--	--	--	H	--	--	--	--	N	--	--	--	--	--	--	N	--	--	--	--	P	--	N	--	--	--	--	--	--
JOE [481]	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--
LOHI [684]	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	N	--	--	--	--	--	--	--	--
McFARLANE [711]	--	N	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	N	--	P	N	--	P	N	--	--	--	N	--	--	--
MIDDLE [302]	--	--	--	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	N	--	N	--	--	P	N	P	--	H	--	--	--	--
NELSON [515]	--	--	--	--	--	--	N	--	--	--	--	P	--	N	--	--	--	--	--	--	P	--	--	P	--	N	--	--	--	--	--	--
NEPAHWIN [714]	N	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	P	P	--	P	--	--	P	--	--	--	--	--	--	--	--
RAMSEY [717]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	H	N	N	--	N	--	--	N	N	--	--	--	--	--	--	--
SANS CHAMBRE [4290]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	N	--	--	--	--	--	--	--	--	--	--	--
SILVER [694]	--	--	--	--	N	--	N	--	N	--	--	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ST CHARLES [695]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	N	--	--	--	--	P	N	H	--	--	--	--	--	--
WAVY [446]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--
WHITSON [479]	--	--	--	--	--	--	--	--	--	--	--	P	--	--	--	--	--	--	P	--	P	--	--	P	P	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Table 20 cont'd: Lake fish occurrence by secondary watershed division (P – Present. H – Historical, N – Nordic Netting 2004 – 2005)
Lake name superscript numbers identify the unique body of water presented in Table 7a

Watershed
2KD Upper Madawaska River

OMNR Fish Codes*

Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
BAT [72]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CRADLE [314]	--	--	--	P	P	--	--	--	--	--	P	--	--	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--
DELANO [76]	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	N	--	--	--	--	P	--
LOUISA [402]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	P	P	N	--	H	N	--	P	--	--	N	--	P	N
TIMBERWOLF [431]	--	--	P	P	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	P	P	--	--	--	H	--

Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
BAT [72]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CRADLE [314]	--	--	--	--	--	--	P	--	P	--	--	--	--	--	P	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DELANO [76]	--	--	--	--	--	--	P	--	H	--	--	--	--	--	H	--	--	--	N	--	--	--	--	N	--	--	--	--	--	--	--	--
LOUISA [402]	N	--	--	P	P	--	N	--	P	--	--	--	--	--	H	--	--	--	P	--	--	--	--	P	--	--	--	--	--	--	--	--
TIMBERWOLF [431]	N	--	--	N	P	--	P	--	P	--	--	N	--	N	--	--	--	--	N	--	--	--	--	P	--	--	--	--	--	--	--	--

Watershed
2HG Scugog River

Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
SCUGOG [8020]	--	--	--	--	--	--	--	P	--	--	--	--	P	--	--	P	--	--	--	--	--	P	P	--	P	--	--	--

Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
SCUGOG [8020]	--	P	--	P	--	--	P	--	--	--	P	P	P	--	--	--	P	P	P	P	P	P	--	P	P	P	--	--	--	--	--	--

Watershed
2HH Pigeon River

Lake Name	76	78	80	81	82	90	91	92	93	102	121	131	132	141	162	163	164	165	182	183	184	185	186	189	194	196	198	199
CHEMONG [46]	--	--	--	--	--	--	--	--	--	--	--	--	P	--	--	P	--	--	--	--	--	--	P	--	--	--	--	--

Lake Name	200	201	206	208	209	210	212	213	214	224	232	233	261	271	281	283	291	311	313	314	316	317	319	331	334	338	339	341	342	381	382	383
CHEMONG [46]	--	P	--	P	--	--	P	--	--	--	--	P	--	--	--	P	--	P	P	--	P	P	--	P	P	--	--	--	--	--	--	--	--

* Table 19 for species names, ** fish survey data unavailable, *** fish survey data from Jackson (1988)

Acknowledgements

Many people contributed to the development and execution of the studies and methods described herein. Foremost among them are the managers Dr. P.J. Dillon 1973 - 1999 and W.A. Scheider 2000 - 2006. The site supervisor Dr. K.M. Somers 1991 - 2006 provided biological and statistical contributions involving littoral zone benthic macroinvertebrates and crayfish studies. All hydrological and meteorological studies associated with the Dorset Environmental Science Centre were under the supervision and execution of L.D. Scott during the period 1978 - 2006. The field and laboratory personnel involved contractors, students (community colleges, universities) and post graduate students too numerous to mention, but we thank them for their contribution.

REFERENCES

Allen, G., N.D. Yan and W.T. Geiling. 1993. ZEBRA2 - Zooplankton enumeration and biomass routines for APIOS: a semi-automated sample processing system for zooplankton ecologists Ontario Ministry of the Environment report, 44 pp. + appendices.

Badgery, J.E., D.J. McQueen, K.H. Nicholls and P.R.H. Schaap. 1994. Trophic interactions in Rice Lake III: Potential for biomanipulation. 1988 -89. Ont. Min. Envir. R/S Technical Report No.10, 34 pp. + appendices.

Badgery, J.E., D.J. McQueen, K.H. Nicholls and P.R.H. Schaap. 1995. Biomanipulation at Rice Lake, Ontario, Canada. *Lake and Reserv. Manage.* 10: 163-173.

Barry, P.J. and E. Robertson. 1975. The energy budget of Perch Lake. In Hydrological studies on a small basin on the Canadian Shield, publ.

Beak Consultants Ltd. 1994. Release of phosphorus from Rice Lake sediments. Ont. Min. Envir. R/S Technical Report No. 8, 120 pp.

Capelli, G.M. and J.J. Magnuson. 1983. Morphoedaphic and biogeographic analysis of crayfish distribution in northern Wisconsin. *J. Crust. Biol.* 3: 548-564.

Chmielewski, C.M., and R.J. Hall. 1992. Responses of immature blackflies (Diptera: Simulidae) to experimental pulses of acidity. Can. J. Fish. Aquat. Sci. 49: 833-840.

Clark, B.J. 1996. Limnological sample and data collection methods used by the Muskoka Lakes Aquatic Assessment Unit. Ont. Min. Envir. Data Report ISBN 0-7778-5757-X. 29 pp.

Clark, B.J. and N.J. Hutchinson. 1992. Measuring the trophic status of lakes: sampling protocals. Ont. Min. Envir. Data Report ISBN 0-7778-0387-9 September 1992. 36 pp.

Clark, B.J. and A.M. Paterson. 2006. The chemical water quality of Lake Nipissing (Technical Report ILG - 04, 2003-2005). Ont . Min. Envir. 39 pp. available as PDF at DESC

Clark, B.J., Paterson, A.M., and Ingram, R.G. 2005. McGown Lake - Report on the 2003 algal bloom. Ontario Ministry of the Environment, Inland Lakes Group, ILG-1. 17 pp. (unpubl.).

Clark, B.J., R. Ingram and A. Paterson. 2007. The chemical water quality of Lake Nipissing 2003 - 2005. Ont. Min. Envir. Data Report (in press)

Collins, N.C., H.H. Harvey, A.J. Tierney and D.W. Dunham. 1983. Influence of predatory fish density ontrappability of crayfish in Ontario lakes.*Can. J. Fish. Aquat. Sci.* 40: 1820-1828.

Cox, E.T. 1978. Counts and measurements of Ontario lakes, watershed unit summaries based on maps of various scales by watershed unit. Fisheries Policy Development Section, Fisheries Branch, Ministry of Natural Resources, for Surveys and Mapping Branch.

David, S.M., K.M. Somers and R.A. Reid. 1994. Long-term trends in the relative abundance of crayfish from acid sensitive, softwater lakes in south central Ontario. A data summary for the first 5 years, 1988 - 1992. Ont. Min. Envir. Data Report Series. ISBN 0-7778-1924-4 15 pp. + 8 appendices

David, S.M., K.M. Somers, R.A. Reid, R.J. Hall and R.E. Girard. 1997a. Sampling protocols for the rapid bioassessment of streams and lakes using benthic macroinvertebrates. Second Edition. Ont. Min. Envir. Data Report Series. ISBN0-7778-5931-9 27 pp. + 6 appendices.

David, S.M., K.M. Somers, R.A. Reid and R.I. Ingram. 1997b. Crayfish species assemblages in softwater lakes in seven tertiary watersheds in south-central Ontario. Ont. Min. Envir. Data Report Series. ISBN 0-7778-6504-1. 102 pp.

Department of Fisheries and Oceans 1979-1986. Notices to Mariners: Lake Muskoka Map No. 5021, May 23, 1986 edition; Lake Muskoka IM12 Map No. 6022, May 23, 1986 edition; Lake Joseph and Rosseau Map No. 5022, May 23, 1986 edition; Lake of Bays Map No. 5023, May 18,1979 edition. Hydrographic Chart Distribution Office Ottawa, Ontario, Canada.

Dillon, P.J., K.H. Nicholls, W.A. Scheider, N.D. Yan and D.S. Jefferies. 1986. Lakeshore Capacity Study, Trophic Status.. ISBN 0-7743 – 8077- 2 89 pp.

Dillon, P.J., H.E. Evans and R.E. Girard 1997. Hypolimnetic alkalinity generation in two dilute oligotrophic lakes in Ontario,Canada. *Water, Air, Soil Pollution* 99: 373-380.

Dodge, D.P., J.C. Tilt, I. MacRitchie, G.A. Goodchild and D.G. Waldriff. 1987. Manual of instructions: Aquatic habitat inventory surveys. 8th Edition. Min. of Nat. Res. Official Procedural Manual, Policy Fl.2.03.01 ISBN 0-7729-2430-9

Gazetteer of Canada - Ontario Edition 1988. Canadian Government Publishing Centre, Supply and Services Canada, Ottawa, Ontario. 428 pp.

Girard, R. and R.A. Reid. 1990a. Dorset Research Centre Study lakes: sampling methodology (1986-89) and lake morphometry. Ont. Min. Envir. Data Report DR 90/4 ISBN 0-7729-7021-1 33 pp. + appendices.

Girard, R., R.A. Reid. 1990b. Morphometric and geological data for nineteen lakes in the Parry Sound and Nipissing Districts and Haliburton County (1986-88). Ont. Min. Envir. Data Report DR 90/2.

Girard, R., R.A. Reid and W.R. Snyder. 1985. The morphometry and geology of Plastic and Heney lakes and their catchments. Ont. Min. Envir. Data Report. DR 85/1. ISBN 0-7729-6583-8 62 pp.

Girard, R., and R.A. Reid. 1991a. Temperature, dissolved oxygen, pH, dissolved inorganic carbon, and percent saturation carbon dioxide data summary for Crosson, Harp, Heney, and Plastic lakes in the Muskoka-Haliburton study area (1985-90). Ont. Min. Envir. Data Report DR 91/1. 55 pp.

Girard, R., and R.A. Reid. 1991b. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Blue Chalk Lake in the Muskoka-Haliburton study area (1976-90) Ont.Min. Envir. Data Report DR 91/2. 149 pp.

Girard, R., and R.A. Reid. 1991c. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Chub Lake in the Muskoka-Haliburton study area (1976-90). Ont. Min. Envir. Data Report DR 91/3. 156 pp

Girard, R., and R.A. Reid. 1991d. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Crosson Lake in the Muskoka-Haliburton study area (1979-90) Ont. Min. Envir. Data Report DR 91/4. 137 pp.

Girard, R., and R.A. Reid. 1991e. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Dickie Lake in the Muskoka-Haliburton study area (1976-90) Ont. Min.Envir. Data Report DR 91/5. 148 pp.

Girard, R., and R.A. Reid. 1991f. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Harp Lake in the Muskoka-Haliburton study area (1976-90) Ont. Min. Envir. Data Report DR 91/6. 167 pp.

Girard, R., and R.A. Reid. 1991g. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Heney Lake in the Muskoka-Haliburton study area (1979-90) Ont. Min.Envir. Data Report DR 91/7. 118 pp.

Girard, R., and R.A. Reid. 1991h. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Plastic Lake in the Muskoka-Haliburton study area (1979-90) Ont. Min. Envir. Data Report DR 91/8. 123 pp.

Girard, R., and R.A. Reid. 1991i. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Red Chalk Lake East in the Muskoka-Haliburton study area (1977-90) Ont. Min. Envir. Data Report DR 91/9. 106 pp.

Girard, R., and R.A. Reid. 1991j. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Red Chalk Lake Main in the Muskoka-Haliburton study area (1976-90) Ont. Min. Envir. Data Report DR 91/10. 157 pp.

Girard, R., and R.A. Reid. 1991k. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Bat, Clara, Clear, Cradle, Crystal, Delano and Drummer lakes in the Parry Sound and Nipissing District and Haliburton County study area (1984-91) Ont. Min. Envir. Data Report DR 91/11. Sensitive Lake Study: Volume 1 of 3. 181 pp.

Girard, R., and R.A. Reid. 1991l. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Hamer, Little Eastend, Little Whetstone, Louck's, Maggie, Pearceley and Pincher lakes in the Parry Sound and Nipissing District and Haliburton County study area (1984-91) Ont. Min. Envir. Data Report DR 91/11. Sensitive Lake Study: Volume 2 of 3. 128 pp.

Girard, R., and R.A. Reid. 1991m. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Round, Shoelace, Skidway, Sunset, Westward, Windfall and Young lakes in the Parry Sound and Nipissing District and Haliburton County study area (1984-91) Ont. Min. Envir. Data Report DR 91/11. Sensitive Lake Study: Volume 3 of 3. 145 pp.

Girard, R., and R.A. Reid. 1991n. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Basshaunt, Bigwind, Buck, Gullfeather, Glen, Little Clear, Solitaire and Walker lakes in the Muskoka-Haliburton study area (1985-90) Ont. Min. Envir. Data Report DR 91/12. 140 pp.

Girard, R., and R.A. Reid. 1991o. Temperature, dissolved oxygen, pH, dissolved inorganic carbon data summary for Brandy, Cinder, Fawn, Healey, Leech, Leonard, McKay, Moot and Poker lakes in the Muskoka-Haliburton study area (1986-90) Ont. Min. Envir. Data Report DR 91/13. 159 pp.

Girard, R., R.A. Reid, S.M. David, K.M. Somers and R. Ingram. 1997a. The littoral-zone benthic macroinvertebrate communities of 12 acid-sensitive, headwater lakes in South-Central Ontario. A summary of the first five years. Ont. Min. Envir. Data Report ISBN 0-7778-6505-X. 29 pp. + 8 app.

Girard, R., R.A. Reid and S.M. David. 1997b. The littoral zone benthic macroinvertebrate communities of 8 low alkalinity lakes and 12 low to moderate alkalinity lakes in south central Ontario. Ont. Min. Envir Data Report ISBN 0-7778-6500-9. 41 pp + 5 appendices.

Girard, R.E., E.C. Hatton, R.A. Reid, K.M. Somers and S.M. David. 2002. Littoral substrate data summary associated with the littoral zone benthic macroinvertebrate survey in Central Ontario. Ont. Min. Envir Data Report ISBN 0-7794-4608-9, PIBS 4339E, 21 pp + 5 appendices.

Girard, R., N.D. Yan, J. Heneberry and W. (Bill) Keller. 2006. Physical and chemical data series from Clearwater, Lohi, Middle and Hannah lakes near Sudbury, Ontario: long-term responses to liming, and natural recovery from historical acidification and metal contamination. Ont. Min. Envir Data Report 140 pp + 2 appendices.

Haney, J.F. and D.J. Hall. 1973. Sugar-coated Daphnia: A preservation technique for Cladocera. *Limnology and Oceanography* 18 (2): 331-333.

Hitchin, G.G. and N.D. Yan. 1983. Crustacean zooplankton communities of the Muskoka-Haliburton study lakes: methods and 1976 - 1979 data. Ont. Min. Envir. Data Report DR 83/9. 130 pp.

Hopkins, G.J. and S.J. Standke. 1992. *Phytoplankton Methods Manual, with Special Emphasis on Waterworks Operation - Internal Methods Manual*. Limnology Section Water Resources Branch, Ontario Ministry of the Environment, Toronto. ISBN 0-7729-8923-0.

Hutchinson, B.A., L.D. Scott, Futter M.N. and A. Morgan 1994a. Hydrology data for lakes and catchments in Muskoka/Haliburton (1980 -92) Ont. Min. Envir. Data Report DR 93/5. ISBN 0-7778-2535-X 100 pp.

Hutchinson, G.E. 1957. *A Treatise on Limnology*. Volume 1. Geography, Physics and Chemistry. John Wiley & Sons Inc., New York. 1015 pp.

Hutchinson, N.J., B.J. Clark, J.R. Munroe and B.P. Neary 1994b. Hydrological data for the watersheds of Rice and Sturgeon lakes. 1986 -1989. Ont. Min.Envir. R/S Technical Report No. 1.,100 pp.

Hutchinson, N.J., J.R. Munroe, B.J. Clark, B.P. Neary and J. Beaver. 1994c. Water chemistry data for Rice Lake,Sturgeon Lake and their respective catchments, 1986 -89. Ont. Min.Envir. R/S Technical Report No. 2, ISBN 0-7778-1104-9 169 p.

Hutchinson, N.J., B.P. Neary, B.J. Clark and J.R. Munroe. 1994d. Nutrient budget data for the watersheds of Rice Lake and Sturgeon Lake. Ont. Min. Envir. R/S Technical Report No. 3, 120 pp.

Hutchinson, N.J., K.H. Nicholls and S.H. Maude. 1994e. Rice and Sturgeon Lake Nutrient Budget Study: Summary and Recommendations. Ont. Min. Envir. R/S Technical Report No. 13.

Ingram, R. G., Girard, R.E., Clark, B.J. Paterson, A.M., Reid, R.E. and Findeis, J.G. 2006. Dorset Environmental Science Centre, Lake Sampling Methods. Ont. Min. Envir. Data Report ISBN 1-4249-2049-3 21 pp. + 8 appendices.

Jackson, D.A. 1988. Fish Communities in Lakes of the Black and Hollow River Watersheds, Ontario. Master of Science Thesis, Department of Zoology, University of Toronto,.

Lazerte, B., D. Gardner and S. McCormick. 1990. Implementation of the database Water at the Dorset Research Centre. Ont. Min. Envir. Data Report Series. 27 pp. plus 4 appendices.

Limnos Ltd. 1994a. Partitioning of Phosphorus in *Potamogeton crispus* Ont. Min. Envir. R/S Technical Report No. 5, 22 pp.

Limnos Ltd. 1994b. Rice Lake macrophytes: distribution, composition, biomass, tissue nutrient content and ecological significance. Ont. Min. Envir. R/S Technical Report No. 7, 123 pp.

Limnos Ltd., Michael Michalski Associates and D.J. McQueen. 1994. Trophic interactions in Rice Lake II. Young-of-the-year yellow perch - *Daphnia* interactions, preliminary findings. Ont. Min. Envir. R/S Technical Report No. 9, 101 pp.

Locke, B.A. 1985. Quality assurance management programme for the Dorset Research Centre. Ont. Min. Envir. Data Report DR 85/4 19 pp.

Locke, B.A. 1990. Quality Control Data Report for the Limnological Section, Dorset Research Centre, Ont. Min. Envir. Data Report DR 90/3. ISBN 0-7729-7427-6 66 pp. + 5 appendices.

Locke, B.A. and E. DeGrosbois 1986. Meteorological Data Base for the Muskoka/Haliburton Area. Ont. Min. Envir. Data Report DR 86/5. 30 pp. + 4 appendices.

Locke, B.A. and L.D. Scott. 1986. Studies of lakes and watersheds in Muskoka-Haliburton, Ontario: methodology (1976-85). Ont. Min. Envir. Data Report DR 86/4. 80 pp.

Lund, J.W.G., C. Kipling and E.D. LeCren. 1958. The inverted microscope method of estimating algal numbers and the statistical basis of estimations by counting. *Hydrobiologia* 11: 143-170.

McCormick, S.A. 1988a. Users manual for the Lab Information System (LIS). Dorset Research Centre. Data Report DR 88/8. 18 pp.

McCormick, S.A. 1988b. Manual Supplement, Station ID numbers for routine and BGC (Dorset) Limnology. Dorset Research Centre.

Michael Michalski Associates and Ontario Ministry of the Environment. 1991. An appendix of chemical chemical and biological data supporting limnological experimentation in enclosures in Rice Lake, 1987. 200 pp.

Morgan, G.E., and E. Snucins. 2005. Manual of Instructions and Provincial Biodiversity Benchmark Values: NORDIC Index Netting 2005. Cooperative Freshwater Ecolody Unit. Department of Biology, Laurentian University, Sudbury, Ontario and Ontario Ministry of Natural Resources, Fish and Wildlife Branch. .32 pp + 5 appendices

Morton, F. I. 1979. Climatological estimates of lake evaporation. *Wat. Resour.Res.* 15: 64 - 76.

Neary, B.P. and P.J. Dillon. 1988. Effects of Sulphur deposition on lake chemistry in Ontario, Canada. *Nature*. 333: 340-343.

Neary, B.P. and B.J. Clark 1992. The Chemical Water Quality of Lake Nipissing 1988 - 90. Dorset Research Centre, Ontario Ministry of the Environment Report, ISBN 0-7729-9063-8 66 pp.

Nicholls, K.H., and E.C. Carney. 1979. The taxonomy of Bay of Quinte phytoplankton and the relative importance of common and rare taxa. *Can. J. Bot.* 57: 1591-1608.

Nicholls, K.H., L. Nakamoto, and W. Keller. 1992. The phytoplankton of Sudbury area lakes (Ontario) and relationships with acidification status. *Can. J. Fish. Aquat. Sci.* 49: 40-51.

Nicholls, K.H., M.F.P. Michalski and W. Gibson. 1994. Trophic interaction in Rice Lake I: An experimental demonstration of effects on water quality. Ont. Min. Envir. R/S Technical Report No. 5, 101 pp.

Nicholls, K.H., M.F.P. Michalski and W. Gibson. 1996. An experimental demonstration of trophic interactions affecting water quality in Rice Lake, Ontario. *Hydrobiologia* 319: 73-85.

Nicolls, A., B.A. Locke and S.A. McCormick. 1986. User manual for the Lab Information System (LIS). Dorset Research Centre, Ont. Min. Envir. Data Report DR 86/2. 17 pp. + appendices

Nicolls, A., R. Reid and R. Girard. 1983. Morphometry of the Muskoka-Haliburton study lakes. Ont.Min. Envir. Data Report DR 83/3. 33 pp.

Ontario Ministry of Environment. 1982. Studies of lakes and watersheds near Sudbury, Ontario. Final limnological report. Ont. Min. Envir. SES 009/82 (Supplementary Volume). 39 pp. + 10 appendices

Ontario Ministry of the Environment. 1984. Water Resources Branch Manual. A guide to the goals, objectives, activities and staff of the Water Resources Branch.

Ontario Ministry of the Environment. 1989. Acid Sensitivity Survey of Lakes in Ontario – 1989. 6th edition Acid Precipitation in Ontario Study Summary 31 pp.

Ontario Ministry of Natural Resources. 1987. Manual of Instructions: aquatic habitat inventory surveys, Fisheries Branch Official Procedural Manual, Policy FI. 2.03.01 Eighth Edition Queen's Park, Toronto.

Okland, J., and K.A. Okland. 1979. Use of fresh-water littoral fauna for environmental monitoring: aspects related to studies of 1000 lakes in Norway. pp. 168-183. *In: The use of ecological variables in environmental monitoring***.** Edited by: H. Hytteborn. Nat. Swedish Environ. Prot. Bd., Rep. SVN PM 1151, 348 pp.

Paterson, A.M. and R.G. Ingram. 2003. An examination of long-term water quality trends in Brandy Lake: Progress Report, Feb. 2003. Ont. Min. Envir., Dorset Environmental Science Centre.

Paterson, A.M. and R.G. Ingram. 2005. McGown Lake: Report on the 2003 algal bloom. Ont. Min. Envir., Dorset Environmental Science Centre, Inland Lakes Group, Technical Report ILG-1.

Paterson, A.M. and B.J. Clark. 2006. The chemical water quality of Lake Nipissing, 2003 – 2005 Ont. Min. Envir., Dorset Environmental Science Centre, Inland Lakes Group, Technical Report ILG-04.

Pawson, T.W. and N.D. Yan. 1993. Zooplankton data and sample archive database design for the Dorset Research Centre. Ontario Ministry of the Environment report. ISBN 0-7778-0520-0 38 pp.

Pla-Rabes, S., A.M. Paterson, J.P. Smol, B.J. Clark and R.G. Ingram. 2007. Spatial variability in water quality and surface sediment Diatom assemblages in a complex lake basin: Lake of the Woods, Ontario, Canada. J. Great Lakes Res. 31: 253-266.

Reid, R.A., R.E.Girard and S.M. David. 1997a. The littoral zone benthic macroinvertebrate communities of 14 small headwater lakes in south central Ontario: A summary of the first two years. Ont. Min. Envir. Tech. Report. ISBN 0-7778-6506-8 64 pp. + appendices

Reid, R.A.,R.E.Girard,S.M. David, K.M. Somers, and R.I. Ingram. 1997b. The littoral zone benthic macroinvertebrate communities of 12 acid sensitive headwater lakes in south central Ontario: A summary of the first five years. Ont. Min. Envir. Tech. Report. ISBN 0-7778-6505-X 52 pp. + appendices.

Reid, R.A.,R.E.Girard.and S.M. David. 1994a. The littoral zone benthic macroinvertebrate communities of 12 acid sensitive headwater lakes insouth-central Ontario: lake selection and preliminary sampling results. Ont. Min. Envir. Tech. Report. ISBN 0-7778-2319-5. 33 pp. + appendices.

Reid, R.A.,R.E. Girard and S.M. David. 1994b. The littoral zone benthic macroinvertebrate communities of 12 acid sensitive lakes in south central Ontario: spring versus fall sampling results. Ont. Min. Envir. Tech. Report. ISBN 0-7778-2320-9 46 pp. + appendices

Reid, R.A. and S.M. David. 1990. Crayfish distribution and species composition in Muskoka and Haliburton lakes. (Summer 1988). Ont. Min. Envir. Data Report DR90/1 ISBN 0-7729-6560-9.

Reid, R.A. and R. Girard. 1987a. Morphometric chemical, physical, and geological data for Axe, Brandy, Cinder, Fawn, Healey, Leech, Leonard, McKay, Moot, Poker, Red Pine lakes in the Muskoka-Haliburton area. (1978-85). Ont. Min. Envir. Data Report DR 87/2. 372 pp.

Reid, R.A. and R. Girard. 1987b. Physical and chemical data for Bonnechere, Big Porcupine, Crown, Kimball, Louisa, Nunikani, Sherborne, Smoke, Timberwolf lakes in the Muskoka-Haliburton area (1983-85). Ont. Min. Envir. Data Report DR 87/1. 255 pp.

Reid, R.A. and R. Girard. 1988. Muskoka Lakes Project 1986 progress report. Lake Muskoka, Lake Joseph, Lake Rosseau, Lake of Bays. Ont. Min. Envir. Data Report DR 88/1. ISBN 0-7729-4071-1 58 pp.

Reid, R.A., R. Girard and A.C. Nicolls. 1987. The morphometry and catchment areas for the calibrated watersheds. Ont. Min. Envir. Data Report DR 87/4. PIBS 264E revised 2006/01/16. 47 pp.

Reid, R.A. and W.R. Snider. 1986. Geology of Big Porcupine, Clear, Crown, Nunikani and Sherborne catchments (Haliburton County) Ont. Min. Envir. Data Report DR 86/1. 76 pp. + 2 appendices.

Reid, R.A., B.A. Locke, R.E. Girard and A.C. Nicolls. 1984. Physical and chemical data summary for twelve selected lakes in the Muskoka-Haliburton area (1981-83). Ont. Min. Envir. Data Report DR 84/1. 355 pp.

Ryback, M. and I. Ryback. 1994. Sediment pigment stratigraphy as evidence of long term changes in primary productivity of Sturgeon and Rice lakes. R/S Technical Report No. 4., 24 pp + appendices.

Scheider, W.A., R.A. Reid, B.A. Locke and L.D. Scott. 1983a. Studies of lakes and watersheds in Muskoka-Haliburton, Ontario: methodology (1976-82). Ont. Min. Envir. Data Report DR 83/1. 39 pp.

Scheider, W.A., C.M. Cox and L.D. Scott. 1983b. Hydrological data for lakes and watersheds in the Muskoka-Haliburton study area (1976-1980). Ont. Min. Envir. Data Report DR 83/6. 62 pp. + 179 figures.

Schindler, D.W. 1969. Two useful devices for vertical plankton and water sampling. *J. Fish. Res. Bd. Canada* 26: 1948-55.

Schindler, D.W. and Nighswander. 1970. Nutrient supply and primary production in Clear Lake eastern Ontario. *J. Fish. Res. Bd. Canada* 27: 2009-2036.

Scott, L.D., J.G. Winter, M.N. Futter and R.E. Girard. 2001. Annual Water Balance and Phosphorus Loading for Lake Simcoe (1990 - 1998). Lake Simcoe Environmental Management Strategy, Implementation Phase II Technical Report No. Imp A. 4. 61 pp.

Scott, L.D., J.G. Winter and R.E. Girard. 2006. Annual Water Balance, Total Phosphorus Budget and Total Nitrogen, Total Chloride Loads for Lake Simcoe (1998 - 2004) Lake Simcoe Environmental Management Strategy, Implementation Phase III Technical Report No. Imp A. 5. 138 pp.

Scott, W.B., and E.J. Crossman. 1973. Freshwater Fishes of Canada. Bulletin 184. Fisheries research Board of Canada, Ottawa ISBN 0-660-10239-0, 966 pp.

Shaw, M.A., S. Geiling, S. Barbour, I.J. Davies, E.A. Hamilton, A. Kemp, R. Reid, P.M. Ryan, N. Watson and W. White. 1992. The Department of Fisheries and Oceans national LRTAP biomonitoring programme: site locations, physical and chemical characteristics. Can. Tech. Rep. *Fish. Aquat. Sci.* 1875: 87 pp.

Somers, K.M. and R.H. Green. 1993. Seasonal patterns in trap catches of the crayfish *C. bartoni* and *O. virilis* in 6 south central Ontario lakes. *Can. J. Zool*. 71: 1136-1145.

Somers, K.M., R.A. Reid, R.E. Girard and S.M. David. 2007. Long term trends in the relative abundance of crayfish from acid sensitive, softwater lakes in south central Ontario: A Summary of 19 years 1988 -2006. Tech Report DR2007 (under review).

Sprules, W.G., L.B. Holtby and G. Griggs. 1981. A microcomputer-based measuring device for biological research. *Can. J. Zool*. 59: 1611-1614.

Standke, S. 1994. The Zooplankton of Rice and Sturgeon lakes, 1986 -88, Kawartha Lakes, Ontario.R/S Technical Report No. 11 32 pp. + appendices.

Sudbury Environmental Study. 1982. Studies of lakes and watersheds near Sudbury Ontario: Final Limnological Report. Supplementary Volume to SES 009/82 Ont. Min. Envir. and Energy, Water Resources Branch, Limnology Section.

Utermohl, H. 1958. Zur. Vervollkommnung der quantitativen Phytoplankton-Methodik. *Mitt. Internat. Verein. Limnol*. 9: 1-39

Wetzel, R.G. 1975. *Limnology*. W.B. Saunders Co., Toronto. 743 pp.

Yan, N.D. and P.M. Welbourn. 1990. The impoverishment of aquatic communities by smelter activities near Sudbury, Canada. In Woodwell, G.M. (ed.). The earth in transition: Patterns and processes of biotic impoverishment, Cambridge University Press, Cambridge, pp. 477-494.

Yan N.D. and P.J. Dillon. 1982. Experimental neutralization of lakes near Sudbury, Ontario: In: Studies of lakes and watersheds near Sudbury, Ontario: Final limnological report. Ont. Min. Environ Sudbury Environ Study Rpt SES 009/82.

Yan, N.D. ,W.I. Dunlop, T.W. Pawson and L.E. Mackay. 1992a. *Bythotrephes cederstroemi* in South-Central Ontario Lakes. A review of the biology of the European Invader, and first records of its occurrence in the zooplankton of inland lakes in Canada. Queen's Printer for Ontario. ISBN 0-7729-9062-X.

Yan, N.D., D.J. McQueen, T.W. Pawson, R. Girard and V. Visman. 1992b. Measuring zooplankton net filtration efficiency in Dorset lakes. Ontario Ministry of the Environment and Energy, Queen's Printer for Ontario, ISBN 0-7729-976-3. 10 pp. + figures.

Yan, N.D., W. Keller, K.M. Somers, T.W. Pawson, and R.E. Girard. 1996. Recovery of crustacean zooplankton communities from acid and metal contamination: comparing manipulated and reference lakes. *Can. J. Fish. Aquat. Sci*. 53: 1301 – 1327.

Yan, N.D. and T.W. Pawson. 1997. Changes in the crustacean zooplankton community of Harp Lake, Canada, following invasion by *Bythotrephes cederstroemi*. *Freshwater Biology* 37: 409-425.

General Taxonomic References for macroinvertebrates.

Merritt, R.W. and K.W. Cummins. 1996. An introduction to the aquatic insects of North America (3rd edition). Kendall/Hunt Publ. Co., Dubuque, IA. 862 pp.

Peckarsky, B.L., P.R. Fraissinet, M.A. Penton and D.J. Conklin, Jr. 1990. Freshwater macroinvertebrates of Northeastern North America. Cornell University Press, Ithaca, N.Y. 442 pp.

Pennak, R.W. 1978. Freshwater invertebrates of the United States (2nd edition). John Wiley and Sons, New York, N.Y. 803 pp.

Thorp, J.H. and A.P. Covich (eds.). 1991. Ecology and classification of North American freshwater invertebrates. Academic Press, San Diego, CA. 874 pp.

Usinger, R.L. 1968. Aquatic insects of California with keys to North American genera and California species. Univ. Calif. Press, Berkeley, CA. 508 pp.

Specialized Macroinvertebrate References

Oligochaeta

Brinkhurst, R.O. 1976. Aquatic Oligochaeta recorded from Canada and the St. Lawrence Great Lakes. *Pac. Mar. Sci*. Rpt. 76-4: 49 pp.

Brinkhurst, R.O. 1986. Guide to the freshwater aquatic microdrile oligochaetes of North America. Can. Spec. Publ. *Fish. Aquat. Sci*. 84. Scientific Information and Publication Branch, Ottawa, Ontario, Canada K1A 0E6. 259 pp.

Hiltunen, J.K. and D.J. Klemm. 1980. A guide to the Naididae (Annelida: Clitellata: Oligochaeta of North America. EPA 600/4-80-031. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring and Support Laboratory, Cincinnati, OH. 48 pp.

Stimpson, K.S., D.J. Klemm and J.K. Hiltunen. 1982. A guide to the Tubificidae (Annelida: Clitellata: Oligochaeta) of North America. EPA 600/3-82-033. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268. 61 pp.

Hirudinea

Klemm, D.J. 1982. Leeches (Annelida: Hirudinea) of North America. EPA 600/3-82-025. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268. 177 pp.

Klemm, D.J. 1985. Freshwater leeches (Annelida: Hirudinea). In: D.J. Kelmm (ed.). A guide to the freshwater Annelida (Polychaeta, naidid and tubificid Oligochaeta and Hirudinea) or North America,. Kendall/Hunt Publ. Co. Dubuque, IA. pp. 70-173.

Amphipoda

Bousfield, E.L. 1958. Freshwater amphipod crustaceans of glaciated North America. *Can. Field Nat.* 72: 55-113.

Holsinger, J.R. 1976. The freshwater amphipod crustaceans (Gammaridae) of North America. *EPA Water Poll. Control Res.* Ser. 18050 ELD04/72. Cincinnati, OH. 80 pp.

Decapoda

Crooker, D.W. and D.W. Barr. 1968. Handbook of the crayfish of Ontario. Life Sci. Misc. Publ. R. Ont. Mus., Univ. Toronto Press, Toronto, Ont. 158 pp.

Odonata

Alker, E.M. and P.S. Corbett. 1975. The Odonata of Canada and Alaska. Vol. 3. Univ. Toronto Press. Toronto, Ontario. 307 pp.

Alker, E.M. 1958. The Odonata of Canada and Alaska. Vol. 2. Univ. Toronto Press. Toronto, Ontario. 318 pp.

Alker, E.M. 1953. The Odonata of Canada and Alaska. Vol. 1. Univ. Toronto Press. Toronto, Ontario. 191 pp.

Cannings, A. and K.M. Stuart. 1977. The dragonflies of British Columbia. B.C. Prov. Mus. Hndk. No. 35. 256 pp.

Needham, J.G. and M.J. Westfall Jr. 1954. Dragonflies of North America (Anisoptera) including the Greater Antilles and the provinces of the Mexican border. Univ. Calif. Press. Berkeley, CA. 615 pp.

Ephemeroptera

Burian, S.K. 1990. The mayflies (Ephemeroptera) of Maine: a faunal survey part I and taxonomy of the Leptophlebiidae, Potamanthidae, Polymiturcyidae and Ephemeridae, part II. PhD. thesis. Univ. Main. UMI No. 9034296. 408 pp.

Burks, B.D. 1953. The mayflies of Illinois. Bull. Ill. Nat. Hist. Surv. 26: 1-216.

Check, G.R. 1982. A revision of the North American species of *Callibbaetis* (Ephemeroptera: Baetidae). PhD. thesis. Univ. Minnesota. UMI No. 8308030. 164 pp.

Edmunds, G.F. Jr., S.L. Jensen and L. Berner. 1976. The mayflies of North and Central America. Univ. Minnesota Press. Minneapolis, MN. 330 pp.

McCafferty, W.P. 1975. The burrowing mayflies (Ephemeroptera: Ephemeroidea) of the United States. *Trans. Am. Entomol. Soc*. 101: 447-504.

Provonsha, A.V. 1990. A revision of the genus Caenis in North America (Ephemeroptera: Caenidae). *Trans. Am. Entomol. Soc.* 116: 801-884.

Plecoptera

Baumann, R.W., A.R. Gaufin and R.F. Sardick. 1977. The stoneflies (Plecoptera) of the Rocky Mountains. *Mem. Am. Entomol. Soc.* 31: 1-208.

Dosdall, L. and D.M. Lemhkuhl. 1979. Stoneflies (Plecoptera) of Saskatchewan. *Quaest. Entomol.* 15: 3-116.

Frison, T.H. 1935. The stoneflies, or Plecoptera, of Illinois. Bull. Ill. Nat. Hist. Surv. 20: 281-371.

Harper, P.P. and H.B.N. Hynes. 1971. The Leuctridae of eastern Canada (Insecta: Plecoptera). *Can. J. Zool.* 49(6): 915-920.

Harper, P.P. and H.B.N. Hynes. 1971. The Capniidae of eastern Canada (Insecta: Plecoptera). *Can. J. Zool.* 49(6): 921-940.

Harper, P.P. and H.B.N. Hynes. 1971. The nymphs of the Taeniopterygidae of eastern Canada (Insecta: Plecoptera). *Can. J. Zool.* 49: 941-947.

Harper, P.P. and H.B.N. Hynes. 1971. The nymphs of the Nemouridae of eastern Canada (Insecta: Plecoptera). *Can. J. Zool.* 49: 1129-1142.

Hitchcock, S.W. 1974. Guide to the insects of Connecticut Part VII. The Plecoptera or stoneflies of Connecticut. Bull. State Geol. Nat. Hist. Surv. 107: 1-262.

Szczytko, S.W. and K.W. Stewart. 1979. The genus *Isoperla* (Plecoptera) of western North America. Holomorphology and systematics and a new stonefly genus *Cascadoperla*. Mem. Am. Entomol. Soc. 32: 1-119.

Trichoptera

Ross, H.H. 1944. The caddisflies, or Trichoptera, of Illinois. Bull. Ill. Nat. Hist. Surv. 23: 1-326.

Wiggins, G.R. 1977. Larvae of the North American caddisfly genera (Trichoptera). Univ. Toronto Press. Toronto, Ontario. 401 pp.

Coleoptera

Bousquet, Y. (ed.). 1991. Checklist of beetles of Canada and Alaska. Agric. Can. Res. Br. Publ. 1861/E. 430 pp.

Brown, H.P. 1976. Aquatic dryopoid beetles (Coleoptera) of the United States. EPA Water Poll. Control Res. Ser. 18050 ELD04/74. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268. 82 pp.

Oygur, S. 1988. Taxonomy, distribution and phenology of North America (north of Mexico) *Gyrinus* Geoffroy (Coleoptera: Gyrinidae). PhD. thesis. Rutgers, The State Univ. New Jersey. UMI No. 8914244. 313 pp.

Smetana, A. 1988. Review of the family Hyrophilidae of Canada and Alaska (Coleoptera). *Mem. Entomol. Soc. Can.* 142: 1-316.

Diptera: Chironomidae

Oliver, D.R. and M.E. Roussel. 1983. The genera of larval midges of Canada (Diptera: Chironomidae). In The insects and arachnids of Canada, part II. Biosystematics Res. Inst. Ottawa, Ontario. Publ. 1746. 263 pp.

Wiederholm, T. (ed.). 1983. Chironomidae of the holarctic region. Keys and diagnoses. Part I. Larvae. *Entomol. Scand. Suppl.* 19: 1-457.

Mollusca

Burch, J.B. 1972. Freshwater *Sphaeriaean* clams (Mollusca: Pelecopoda) of North America. Biota of Freshwater Ecosystems Identification Manual No. 3. U.S. Environmental Protection Agency, Washington, D.C. 31 pp.

Burch, J.B. 1973. Freshwater unionacean clams (Mollusca: Pelecopoda) of North America. Biota of Freshwater Ecosystems Identification Manual No. 11. U.S. Environmental Protection Agency, Washington, D.C. 176 pp.

Burch, J.B. 1982. Freshwater snails (Mollusca: Gastropoda) of North America. EPA 600/3-82-026. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH. 294 pp.

Burch, J.B. 1989. North American freshwater snails. Malacological Publ. Ann Arbor, MI. 365 p.

Clark, A.H. 1981. Freshwater molluscs of the Canadian Interior Basin. *Malacologia*. 13: 1-509.

General Taxonomic References for zooplankton

Pennak, R.W. 1978. Freshwater invertebrates of the United States (2nd Edition). John Wiley and Sons, New York, N.Y. 803 pp.

Thorp, James H. and Covich, Alan P. (eds.) 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, San Diego, CA. 874 pp.

Ward, H.B. and G.C. Whipple. 1959. Freshwater biology. Second Edition. Edited by W.T. Edmondson. ISBN 0 471 23298 X Library of Congress Catalog Card Number: 59-6781. 1116 pp.

Witty**,** L.M. 2004. Practical Guide to Identifying Freshwater Crustacean Zooplankton. 2nd edition. Cooperative Freshwater Ecology Unit, Department of Biology, Laurentian University, Sudbury, Ontario Canada**.** 50 pp.

Specialized Zooplankton References

Bosminidae

Deevey, E.S. and G.B. Deevey. 1971. The American Species of *Eubosmina* Seligo (Crustacea, Cladocera) *Limnol. Oceanogr*. 16: 201-218.

De Melo, R. and Hebert, P.D.N. 1994a. Allozymic Variation and Species Diversity in North American Bosminidae. *Can. J. Fish. Aquat. Sci*. 51: 873-880.

De Melo, R. and Hebert, P.D.N. 1994b. A Taxonomic reevaluation of North American Bosminidae. *Can. J. Zool*. 72: 1808-1825.

Haney, R.A. and D.J Taylor 2003 Testing paleolimnological predictions with molecular data: the origins of Holarctic Eubosmina. *J. Evol. Biol*. 16: 871-882. Blackwell Publishing Ltd.

Leider, U. 1983. Revision of the genus *Bosmina* Baird, 1845 (Crustacea, Cladocera). Int. Revue ges. Hydrobiol. 68: 121-139.

Taylor, D.J., C.R. Ishikane and R.A. Haney. 2002. The systematics of Holarctic bosminids and a revision that reconciles molecular and morphological evolution. *Limnol. Oceanogr*. 47: 1486-1495.

Copepoda

Cyclopoid and Harpacticoid Copepods

Bayly, I.A.E. 1992. The Non-marine Centropagidae (Copepoda: Calanioda) of the world. (Guides to the identification of the microinvertebrates of the continental waters of the world 2). The Hague: SPB Academic Publishing. With ref. ISBN 90-5103-075-4. 30 p.

Dodson, S. 1994. Morphological analysis of Wisconson (U.S.A.) species of the *Acanthocyclops vernalis* group (Copepoda: Cyclopoida). *J. Crustacean Biol*. 14: 113-131. [note: *A. Vernalis, A. robustus* and *A. brevispinosis.*]

Dussart, B.H. and D. Defaye. 1995. Copepoda: Introduction to the Copepoda Coordinating editor: H.J.F. Dumond. The Hague: SPB Academic Publishing. - (Guides to the identification of the microinvertebrates of the continental waters of the world. ISBN 0928-2440 ; 7) With ref. ISBN 90-5103-098-3, Amsterdam, The Netherlands. 277 pp.

Dussart, B.H. and C.H. Fernando. 1990. A Review of the taxonomy of five Ontario genera of freshwater cyclopoid Copepoda (Crustacea). *Can. J. Zool*. 68: 2594-2604.

Fernando, C.H. 1987. A systematic and Distributional Study of the Calanoid and Cyclopoid Copepoda of Canadian Freshwaters. WRI Proposal # 1325901 University of Waterloo, Waterloo Research Institute. 88 pp.

Hudson, P.L., J.W. Reid, L.T. Lesko and J.H. Selgeby. 1998. Cyclopoid and Harpacticoid Copepods of the Laurentian Great Lakes. Ohio Biological Survey Bulletin NS 12 (2). 50 pp.

Reddy, Y. Ranga. 1994. Copepoda : Calanoida : Diaptomidae. Key to the genera *Heliodiaptomus, Allodiaptomus, Neodiaptomus, Phyllodiaptomus, Eodiaptomus, Arctodiaptomus* and *Sinodiaptomus*. (Guides to the identification of the microinvertebrates of the continental waters of the world. Coordinating editor: H.J.F. Dumond. SPB Academic Publishing. ISSN 0928-2440 : 5). With ref. ISBN 90-5103--089-4. 221 pp.

Ulrich, Einsle. 1996. Copepoda: Cyclopoida. Genera Cyclops, Megacyclops, Acanthocyclops. (Guides to the identification of the microinvertebrates of the continental waters of the world 10). Coordinating editor: H.J.F. Dumond. SPB Academic Publishing. ISSN 0928-2440 ; 10. With ref. ISBN 90-5103-125-4 82 pp.

Williamson, C.E. 1991. Copepoda. In Thorp, James H. and Covich, Alan P. (eds.) 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, San Ciego, CA. pp. 787-822.

***Cladocera* (*Anomopoda*)**

Smirnov, N.N. 1996. Cladocera : the Chydorinae and Sayciinae (Chydoridae) of the world. (Guides to the identification of the microinvertebrates of the continental waters of the world. Coordinating editor: J.F. Dumond. SPB Academic Publishing. ISSN 0928-2440 ; 11.) With ref. ISBN 90-5103-129-7. 197 pp.

Dobson, S.I. and D.G. Frey. 1991. Cladocera and Other Branchiopoda. In Thorp, James H. and Covich, Alan P. (eds.) 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, San Diego, CA. pp. 723-786.

Hann, B.J., 1981. Occurrence and distribution of littoral Chydoridae (Crustacea, Cladocera) in Ontario, Canada, and taxonomic notes on some species. *Can. J. Zool*. 59: 1465-1474.

Hann. B.J., 1982. Two new species of *Eurycercus* (*Bullatifrons*) from Eastern North America (Chydoridae, Cladocera). Taxonomy, Ontogeny and Biology. *Int. Revue ges. Hydrobiol*. 67: 585-610.

Diaphanosoma bergei Korinek, 1981

Korinek, V. 1981. *Diaphanosoma birgei* n. sp. (Crustacea, Cladocera). A new species from America and it's widely distributed subspecies *Diaphanosoma bergei* ssp. *lacustis* n. ssp. *Can. J. Zool*. 59: 1115-1121.

Crustacae : Daphniiformes (*Ctenopoda*)

Korovchinsky, N.M. 1992. Sididae and Holopediidae (Crustacae: Daphniiformes) (Guides to the identification of the microinvertebrates of the continental waters of the world 3). The Hague : SPB Academic Publishing. With ref. ISBN 90-5103-074-6, 82 pp.

Korovchinsky, N.M. 1986. On the taxonomy and geographical distribution of the superfamily Sidoidea Baird, 1850 (Crustacea: Cladocera). *Hydrobiologia* 140: 243-253.

Smirnov, N.N. 1992. The Macrothricidae of the world. - III. (Guides to the identification of the microinvertebrates of the continental waters of the world. 1). The Hague: SPB. Academic Publishing. With ref. ISBN 90-5103-067-3, 143 pp.

Daphnia (Anomopoda)

Brooks, J.L. 1957. The Systematics of North American *Daphnia* . *Mem. Conn. Acad. Arts. Sci*. 13: 1-180.

Balcer, M.D., N.L. Korda and S.I. Dodson. 1984. Zooplankton of the Great Lakes. A Guide to the Identification and Ecology of the Common Crustacean Species. The University of Wisconson Press, ISBN 0-299-09820-06. 174 pp.

Colbourne, J.K. and P.D.N. Hebert. 1996. The systematics of North American *Daphnia* (Crustacea: Anomopoda): a molecular phylogenetic approach. *Trans. R. Soc. Lond. B. Biol. Sci.* 351: 349-360.

Dodson, S.I. 1981. Morphological variation of *Daphnia pulex* Leydig (Crustacea: Cladocera) and related species from North America. *Hydrobiologia* 83: 101-114.

Hebert, P.D.N. and T.L. Finston. 1997. A taxonomic reevaluation of North American *Daphnia* (Crustacea: Cladocera). III. The *D. catawba* complex. *Can. J. Zool*. 75: 1254 -1261

Taylor, D.J., T.L. Finston and P.D.N. Hebert. 1998. Biogeography of a widespread freshwater Crustacean: Pseudcongruence and Cryptic endemism in the North American *Daphnia Laevis* complex. *Evolution* 52: 1648-1670.

Mysidacea

Mysis oculata relicta

Balcer, M.D., N.L. Korda and S.I. Dodson. 1984. Zooplankton of the Great Lakes. A Guide to the Identification and Ecology of the Common Crustacean Species. The University of Wisconson Press, ISBN 0-299-09820-06.

Johannsson, O.E. 1995. Responce of Mysis relicta population dynamics and productivity to spacial and seasonal gradients in Lake Ontario. *Can. J. Fish. Aquat. Sci*. 52: 1509-1522

Chaoboridae

Borkent, A. 1979. Systematics and bionomics of the species of the subgenus *Schadonophasma* Dyar and Shannon (Chaoborus, Chaoboridae, Diptera). *Quaest. Entomol*. 15: 122-255

Saether, O.A. 1972. Chaoboridae. pp. 257-280. Freshwater Institute, Winnipeg, Manitoba.

Branchiopoda (class)

Martin, J. W. 1992. *Branchiopoda* : Chapter 3 in Microscopic Anatomy of Invertebrates. Volume 9: Crustacea, pp. 25-224. Wiley-Liss, Inc., New York.

(Order) ***Haplopoda*** Sars, 1865

Leptodoridae Lilljeborg, 1861

Leptodora kindtii (Focke, 1844): in Rivier I.K. (1998).

(Order) ***Onychopoda*** Sars, 1865

(Family) ***Polyphemidae*** Baird, 1845

Butorina, L.G. 1998. Resting eggs and hatching of young *Polyphemus pediculus* (Crustacea, Onychopoda. *Arch. Hydrobiol. Issues Advanc. Limnol*. 52: 521-534.

Butorina, L.G. 2000. A review of the reproductive behaviour of Polyphemus pediculus (L.) Muller (Crustacea: Branchiooda). *Hydrobiologia* 427: 13-26.

Polyphemus pediculus Linnaeus, 1761: in Rivier, I.K. (1998).

(Family) ***Cercopagididae*** (Mordukhai-Boltovskoi, 1968)

Genus ***Bythotrephes*** (Leydig, 1860)

Martin, J.W. and C.E. Cash-Clark. 1995. The external morphology of the Onychopod 'Cladoceran' genus *Bythotrephes* (Crustacea, Branchiopoda, Onychopoda, Cercopagididae), with notes on the morphology and phylogeny of the order Onychopoda. *Zoologica Scripta*. (The Norwegian Academy of Science and Letters) 24: 61-90.

Rivier, I.K. 1998. The Preditory Cladocera (Onychopoda: Podonidae, Polyphemidae, Cercopagidae) and Leptodorida of the World. Guides to the identification of the microinvertebrates of the continental waters of the world. 13. Backhuys Publishing, Leiden, The Netherlands. ISSN 0928-2440

Therriault, T.W., I.A. Grigorovich, M.E. Cristescu, H.A.M. Ketelaars, M. Viljanen, D.D. Heath and H.J. Macisaac. 2002. Taxonomic resolution of the genus *Bythotrephes* Leydig, using molecular markers and re-evaluation of its global distribution, with notes on factors affecting dispersal, establishment and abundance. *Diversity and Distribution* 129: 1-18.

Genus ***Cercopagis*** Sars, 1897

Subgenus ***Cercopagis*** (Mordukhai-Boltovskoi & Rivier, 1987)

C. (Cercopagis) pengoi (Ostroumov, 1892): in Rivier, I.K. (1998)

Grigorovich, I.A., H.J. MacIsaac, I.K. Rivier, NV. Aladin and V.E. Panov. 2000. Comparative biology of the predatory cladoceran *Cercopagis pengoi* from Lake Ontario, Baltic Sea and Caspian Sea. *Arch. Hydrobiol*. 149: 23-50.

Rotifera

De Smet, W. H. 1996. Rotifera, Volume 4: The Proalidae (Monogononta). Guides to the identification of the microinvertebrates of the continental waters of the world. 9 ISSN 0928-2440. The Hague: SPB Academic Publishing. With ref. ISBN 90-5103-119-X 102 pp.

Nogrady, T., R. L. Wallace and . W. Snell. 1993. Rotifera Volume 1: Biology, Ecology and Systematics. Guides to the identification of the microinvertebrates of the continental waters of the world. 4. ISSN 0928-2440. The Hague: SPB Academic Publishing. ISBN 90-5103-080-0 142 pp.

Nogrady T., R. Pourriot and Segers, H. 1995. Rotifera, Volme 3: Notommatidae and Scaridiidae. Guides to the identification of the microinvertebrates of the continental waters of the world. 8 ISSN 0928-2440. The Hague : SPB Academic Publishing. ISBN 90-5103-103-3. 248 pp.

Ruttner-Kolisko, A. 1977. Suggestionbs for biomass calculation of plankton rotifers. *Arch. Hydrobiol. Beih. Ergebn. Limnol*. 8: 71-76.

Segers, H. 1995. Rotifera, Volume 2: The Lecanidae (Monogononta) Guides to the identification of the microinvertebrates of the continental waters of the world. 6. ISSN 0928-2440. The Hague: SPB Academic Publishing. With ref. ISBN 90-5103-091-6. 226 pp.

Crustacean Zooplankton Length - Weight Relationship References:

Branstrator, D.K. 1995. Ecological interactions between *Bythotrephes cederstroemi* and *Leptodora kindtii* and the implications for species replacement in Lake Michigan. *J. Great Lakes Res*. 21: 670-679.

Culver, D.A., M.M. Boucherle, D.J. Bean and J.W. Fletcher. 1985. Biomass of freshwater crustacean zooplankton from length-weight regressions. *Can. J. Fish. Aquat. Sci*. 42: 1380-1390.

Johannsson, O.E. 1995. Response of *Mysis relicta* population dynamics and productivity to spacial and seasonal gradients in Lake Ontario. *Can. J. Fish. Aquat. Sci*. 52: 1509-1522.

Lasenby, D.C., N.D. Yan and M.N Futter. 1994. Changes in body dimensions of larval *Chaoborus* in ethanol and formalin. *J. Plankton Res*. 16: 1601-1608.

McCauley, E. 1984. The estimation of the abundance and biomass of zooplankton in samples. pp. 228-265, In J.A. Downing and F.H. Rigler [ed.]. A manual on methods for the assessment of secondary productivity in fresh waters. 2nd ed. Blackwell Scientific Publications, Oxford.

Sprules, W.G. 1984. Towards an optimal classification of zooplankton for lake ecosystem studies. *Verh. Internat. Verein Limnol*. 22: 320-325.

Yan, N.D. and G.L. Mackie. 1987. Improved estimation of the dry weight of *Holopedium gibberum* (Crustacea, Cladocera) using clutch size, a body fat index, and lake water total phosphorus concentration. *Can. J. Fish. Aquat Sci*. 44: 382-389.

Yan, N.D. and T.W. Pawson. 1997. Changes in the Crustacean zooplankton community of Harp Lake, Canada, following the invasion by *Bythotrephes cederstroemi*. *Freshwat. Biol*. 37: 409-425.

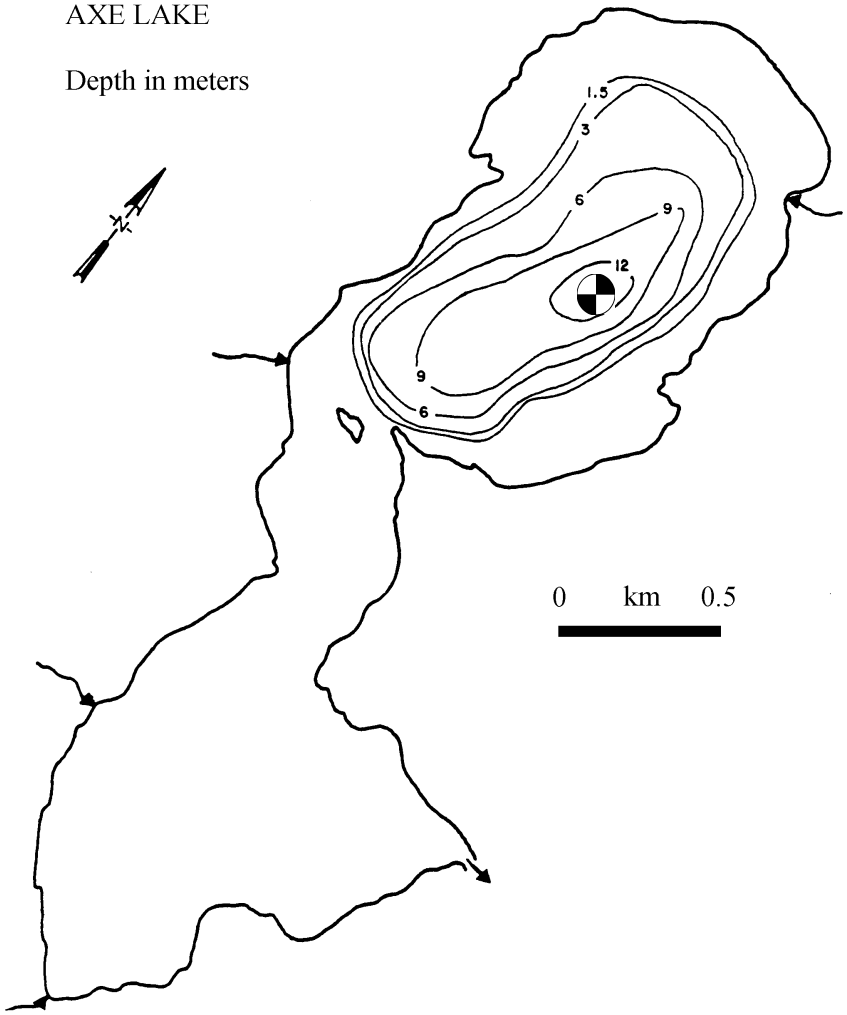
Appendix 1

Lake Morphometry, including area, volume, mean depth, maximum depth, shoreline length, development of shoreline, development of volume, contour depth, contour area, and stratum volume. Bathymetric maps show chemistry sampling location and sites for crayfish and kick and sweep littoral zone benthic macroinvertebrate sampling.

Axe Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
264.0	66.2	2.5	15.0	10.6	1.830	0.502

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	264	
		32.2
2	76.2	
		13.6
4	59.6	
		10.2
6	42.5	
		7.08
8	28.8	
		4.34
10	15.3	
		1.84
12	4.21	
		0.402
15	0.446	

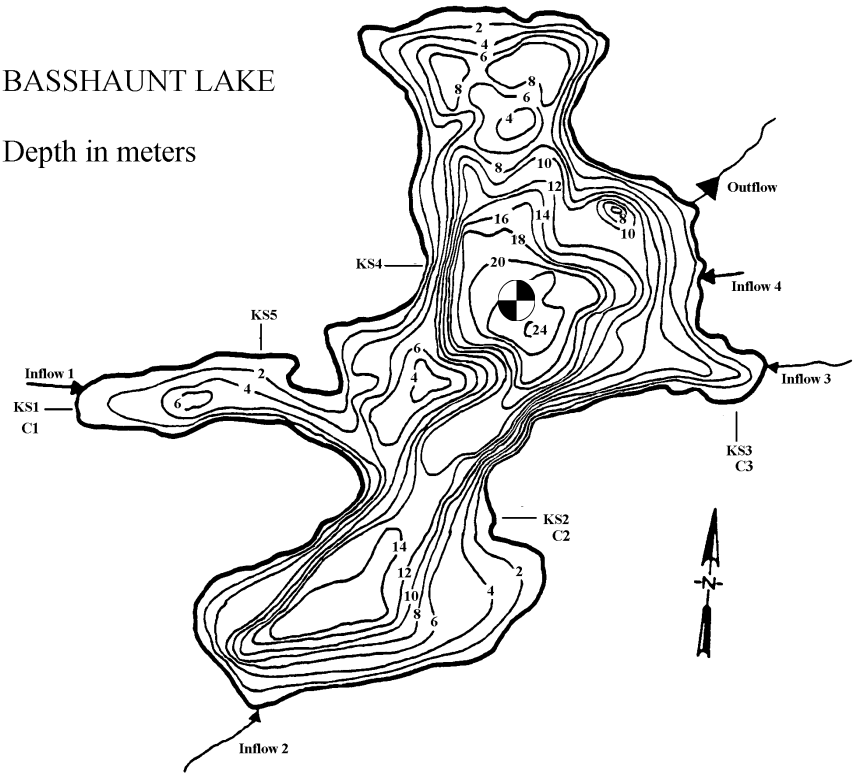


Secchi Disc = Chemistry sampling location

Basshaunt Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
47.3	36.6	7.7	24	4.85	1.99	0.96

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	47.3	
		8.64
2	39.2	
		7.11
4	32	
		5.57
6	23.9	
		4.25
8	18.7	
		3.35
10	14.9	
		2.63
12	11.5	
		1.95
14	8.07	
		1.26
16	4.66	
		0.824
18	3.60	
		0.594
20	2.38	
		0.328
22	1.00	
		0.091
24	0.00	

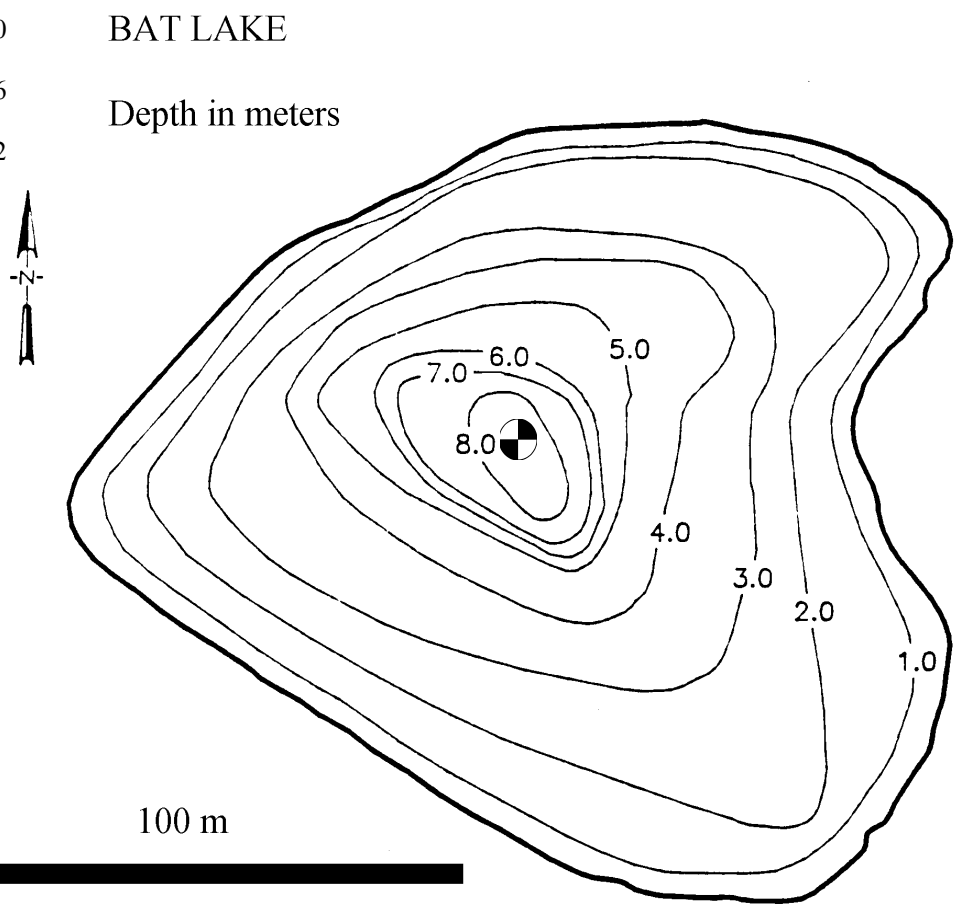


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Bat Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
2.33	0.69	2.94	8.3	0.64	1.18	1.06

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	2.33	
		0.40
2	1.59	
		0.20
4	0.55	
		0.06
6	0.16	
		0.02
8.3	0.00	

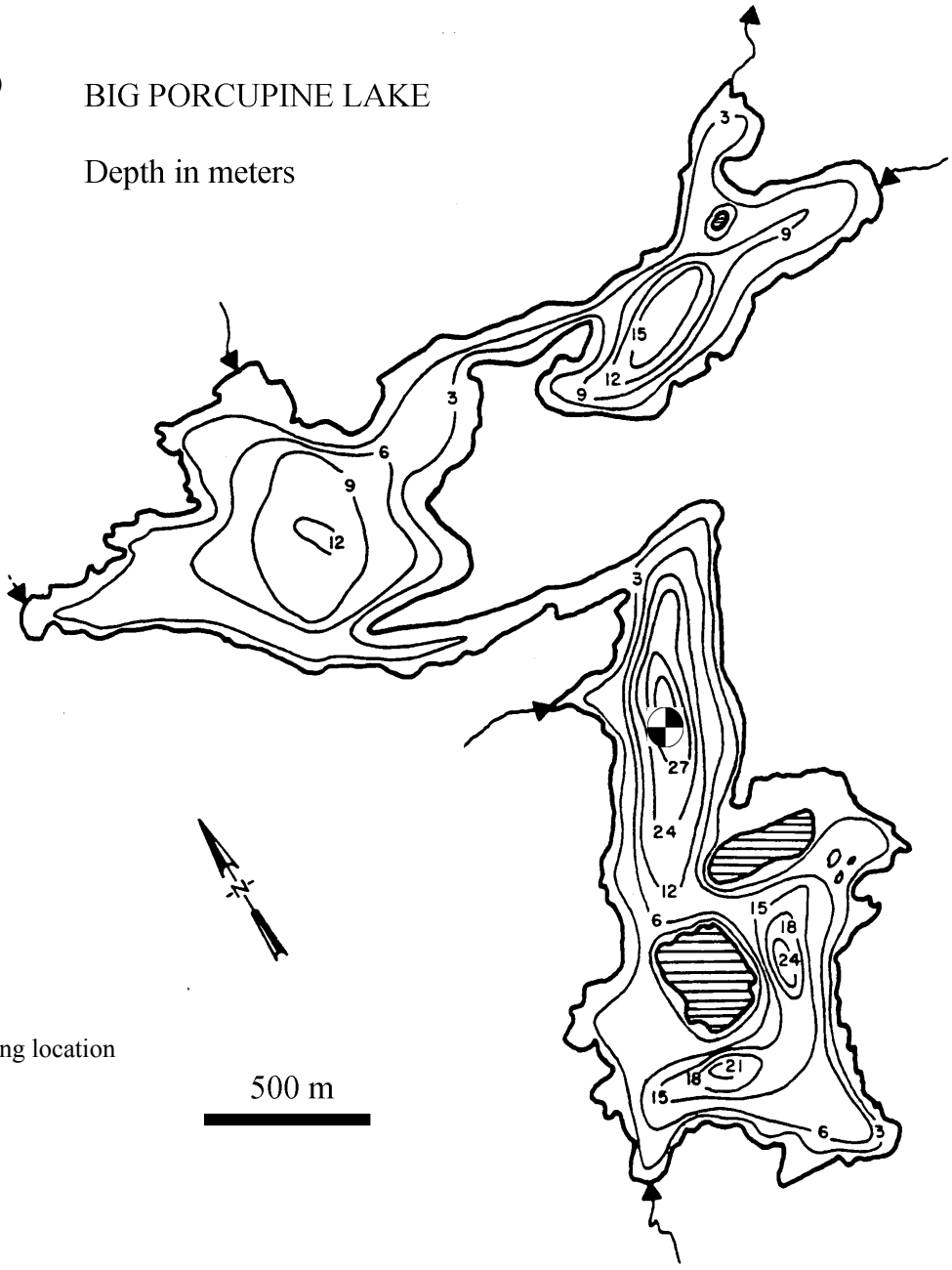


Secchi Disc = Chemistry sampling location

Big Porcupine Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
235	177.4	7.54	30.5	17.5	3.22	0.74

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	235	
		42.0
2	185	
		33.0
4	145	
		25.6
6	111	
		19.9
8	88.1	
		15.5
10	67.2	
		11.5
12	48.0	
		8.41
14	36.4	
		6.29
16	26.7	
		4.45
18	18.1	
		3.26
20	14.6	
		2.61
22	11.6	
		1.94
24	7.95	
		1.30
26	5.17	
		0.819
28	3.11	
		0.482
30	1.78	
		0.082
30.5	1.50	

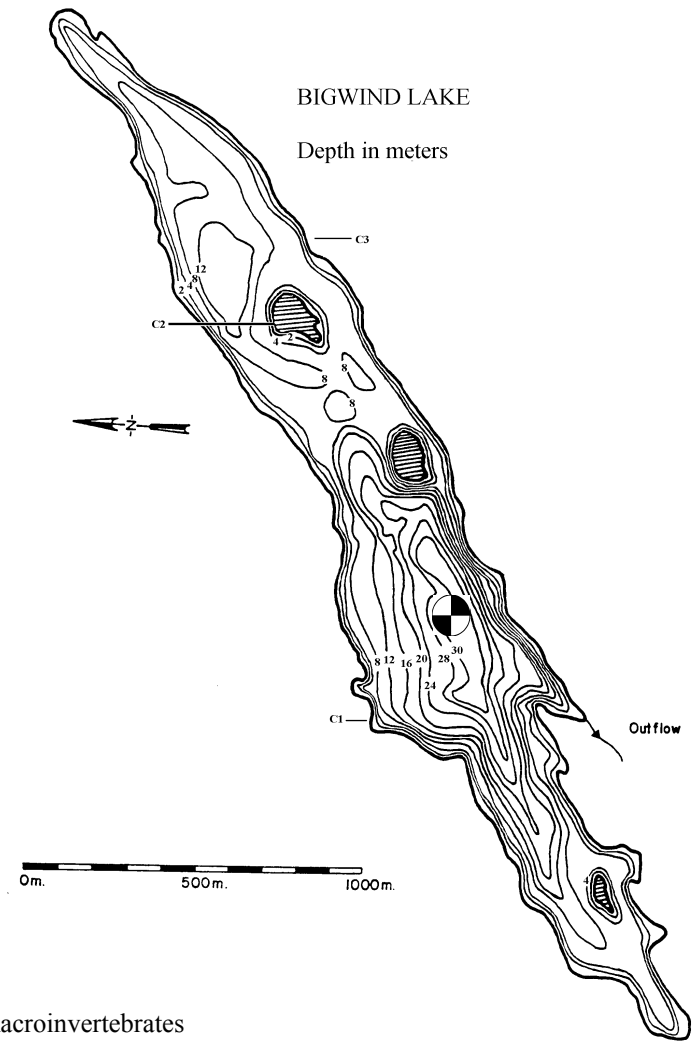


Secchi Disc = Chemistry sampling location

Bigwind Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
111	118	10.7	32	8.24	2.21	1.00

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	111	
		20.8
2	97.2	
		18.36
4	87.0	
		15.74
6	70.7	
		12.63
8	56.0	
		10.14
10	45.6	
		8.17
12	36.3	
		6.68
14	30.7	
		5.62
16	25.6	
		4.72
18	21.7	
		3.98
20	18.2	
		3.33
22	15.2	
		2.76
24	12.5	
		2.19
26	9.49	
		1.633
28	6.9	
		1.033
30	3.61	
		0.240
32	0.00	

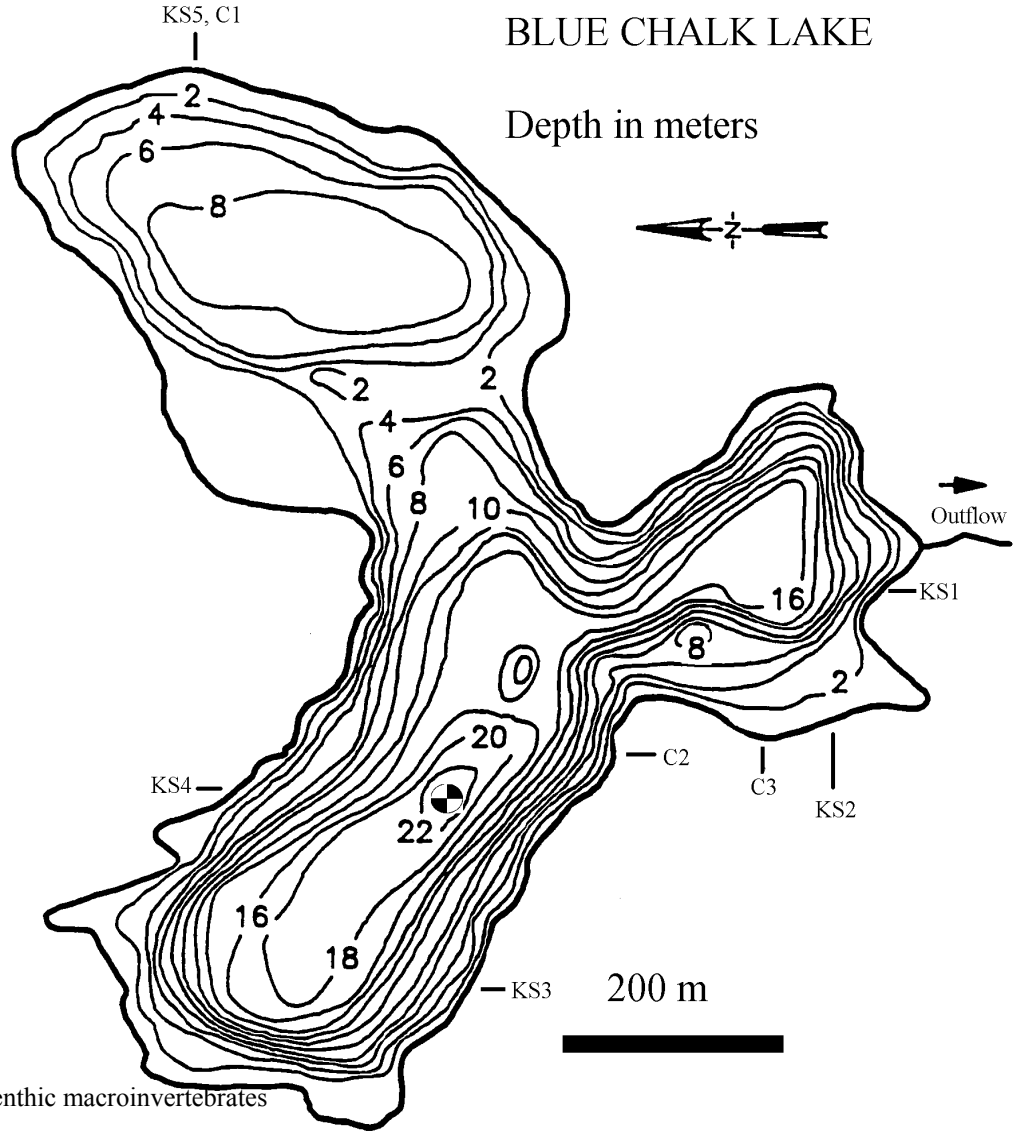


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Blue Chalk Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
52.35	44.68	8.5	23.0	4.67	1.82	1.11

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	52.35	
		9.42
2	42.08	
		7.83
4	36.28	
		6.74
6	31.14	
		5.55
8	24.52	
		4.19
10	17.56	
		3.29
12	15.34	
		2.79
14	12.64	
		2.28
16	10.22	
		1.49
18	5.02	
		0.79
20	2.93	
		0.29
22	0.38	
		0.01
23	0.00	

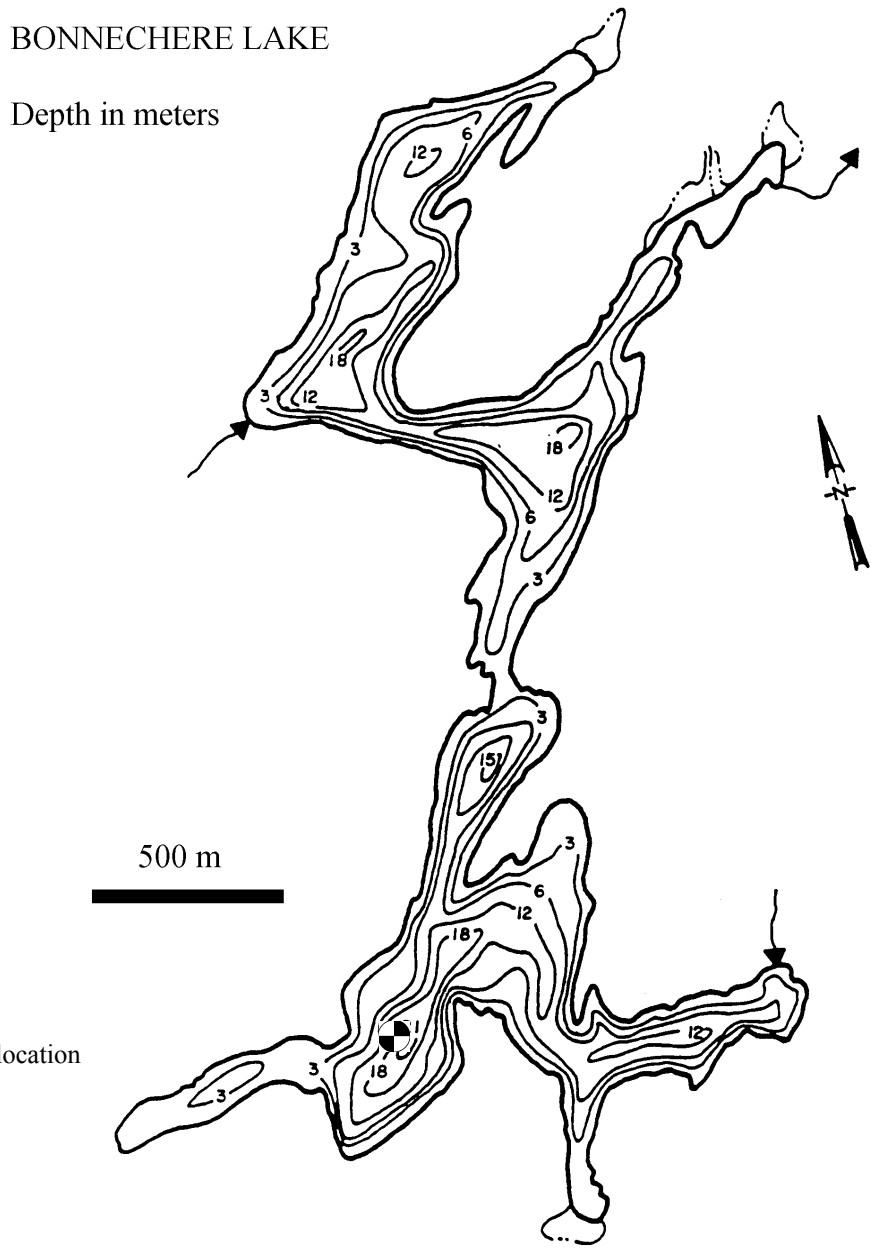


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Bonnechere Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
105	67.0	6.4	21.4	11.46	3.16	0.90

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	105	
		18.3
2	78.6	
		13.8
4	59.9	
		10.5
6	44.9	
		8.03
8	35.6	
		6.21
10	26.7	
		4.46
12	18.2	
		2.82
14	10.4	
		1.58
16	5.65	
		0.933
18	3.75	
		0.511
20	1.52	
		0.135
21.4	0.50	

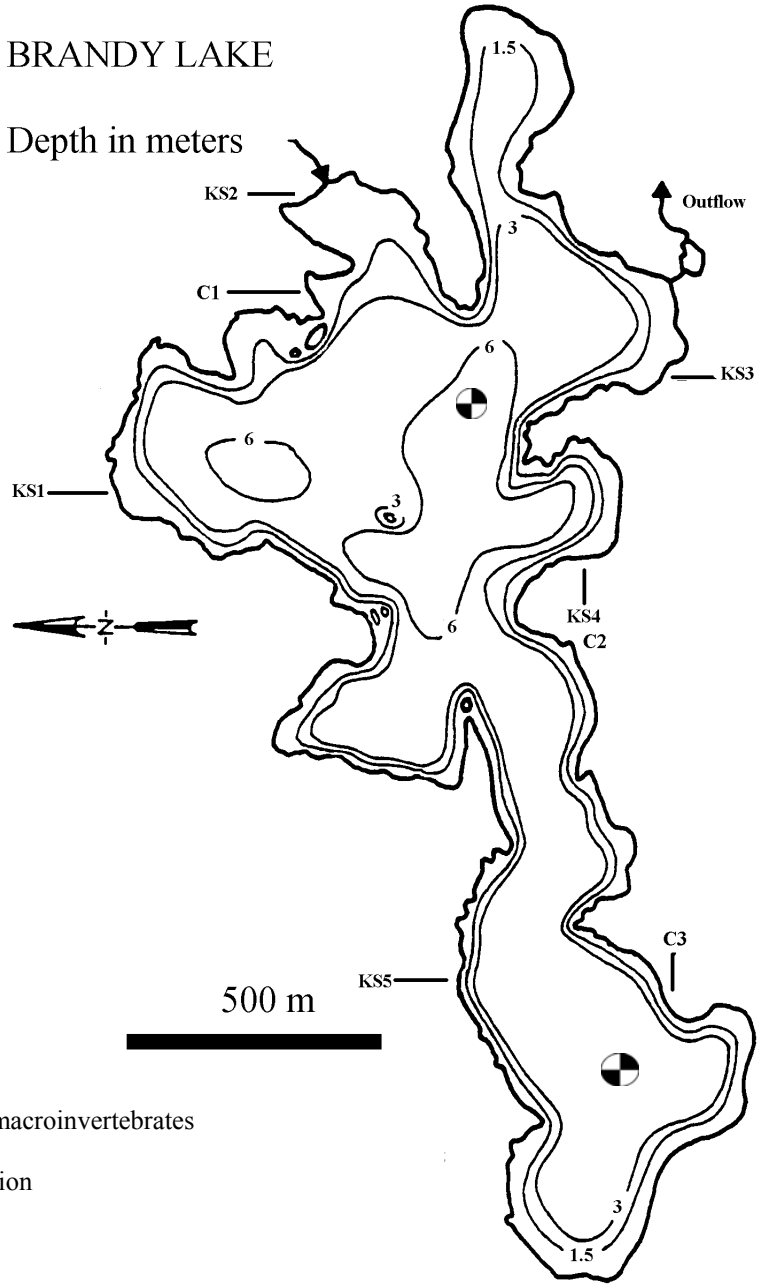


Secchi Disc = Chemistry sampling location

Brandy Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
108	37.7	3.5	7.5	9.76	2.65	1.40

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	108	
		18.5
2	77.9	
		12.3
4	46.0	
		5.68
6	13.9	
		0.697
7.5	0.00	

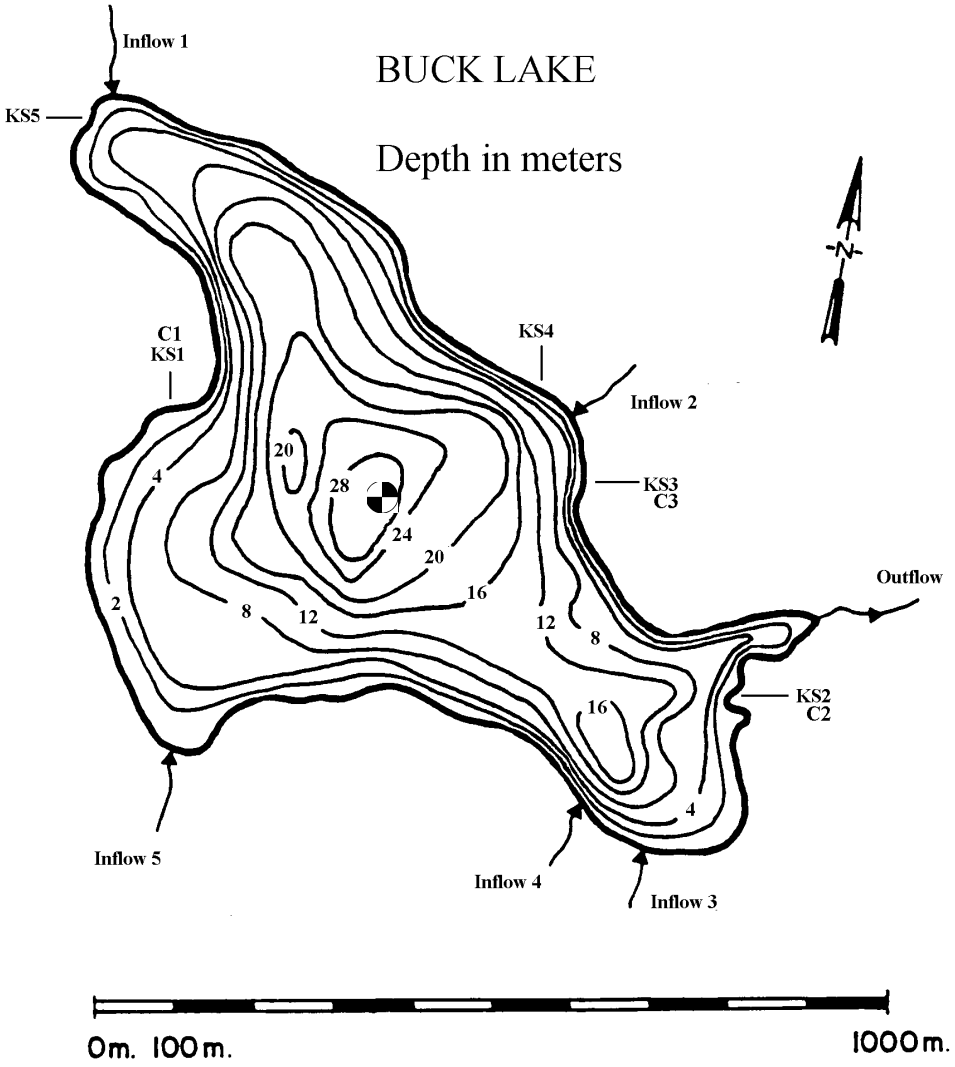


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Buck Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
40.3	43.9	10.9	30.0	3.56	1.58	1.09

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	40.3	
		7.52
2	34.9	
		6.58
4	31.0	
		5.77
6	26.8	
		4.95
8	22.8	
		4.22
10	19.5	
		3.63
12	16.8	
		3.31
14	14.5	
		2.55
16	11.1	
		1.90
18	7.95	
		1.39
20	6.03	
		0.974
22	3.79	
		0.596
24	2.24	
		0.377
26	1.55	
		0.238
28	0.864	
		0.083
30	0.00	

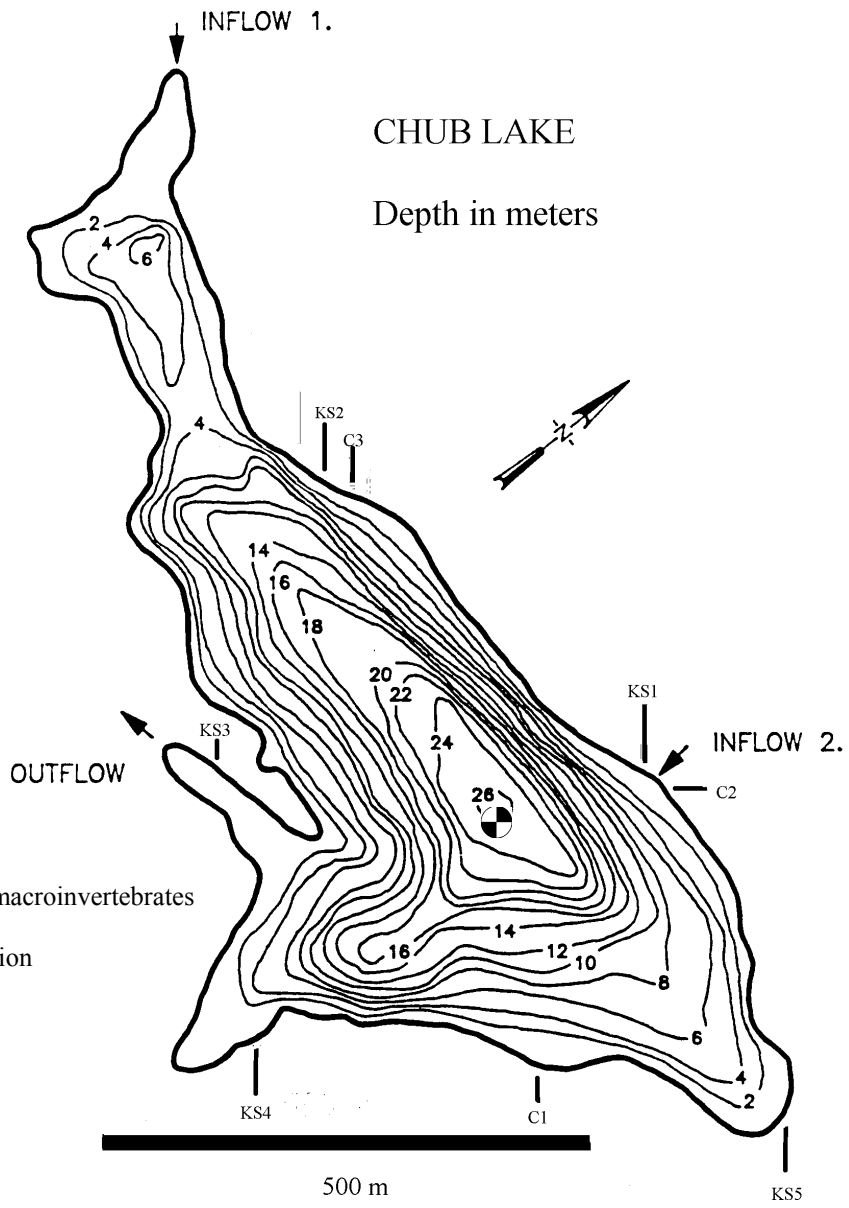


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Chub Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
34.41	30.42	8.9	27.0	4.18	2.01	0.99

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	34.41	
		6.17
2	27.39	
		5.06
4	23.22	
		4.19
6	18.71	
		3.39
8	15.25	
		2.81
10	12.88	
		2.37
12	10.89	
		1.91
14	8.25	
		1.46
16	6.4	
		1.13
18	4.93	
		0.84
20	3.47	
		0.6
22	2.52	
		0.38
24	1.34	
		0.12
26	0.12	
		0.004
27	0.00	

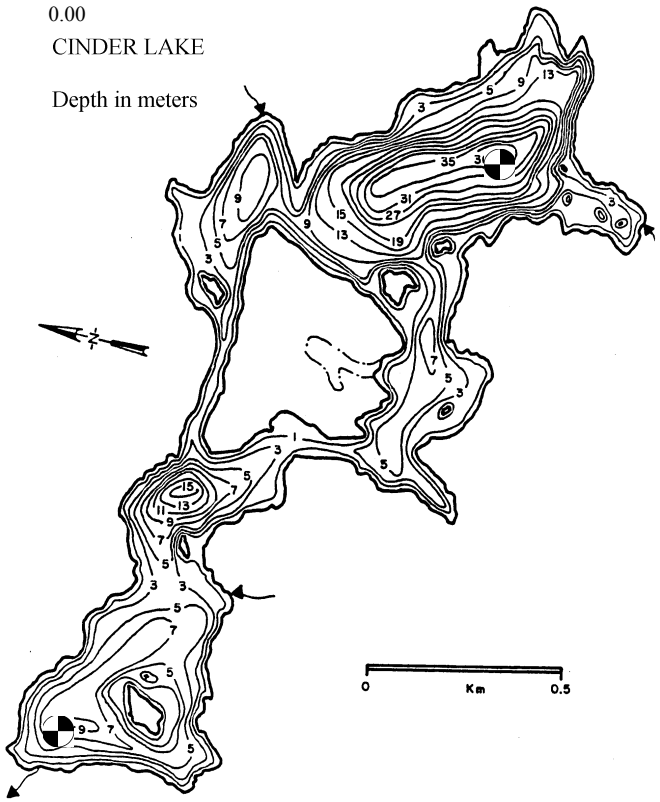


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Cinder Lake morphometry summary

	Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
Whole Lake	77.0	63.6	8.3	36.5	11.5	3.70	0.68
East Basin (CIE)	50.1	50.7	10.1	36.5	7.33	2.92	0.83
Main Basin (CI)	26.9	12.8	4.8	16	4.15	2.25	0.89

Whole Lake			East Basin (CIE)		Main Basin	
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	77.0		50.1			
		13.8		9.07	4.78	
2	61.3		49.2		21.0	
		10.8		7.11	3.64	
4	46.7		31.6		15.1	
		8.0		5.61	2.39	
6	33.3		24.5		8.81	
		5.55		4.31	1.22	
8	23.5		19.6		3.67	
		4.08		3.64	0.433	
10	18.2		16.8		1.39	
		3.34		3.13	0.207	
12	15.4		14.7		0.766	
		2.87		2.75	0.112	
14	13.2		12.8		0.356	
		2.44		2.39	0.033	
16	11.3		11.2		0.00	
		2.10		2.09		
18	9.85		9.85			
		1.87		1.87		
20	8.90		8.90			
		1.7		1.7		
22	8.15		8.15			
		1.55		1.55		
24	7.19		7.19			
		1.35		1.35		
26	6.56		6.56			
		1.27		1.27		
28	5.82		5.82			
		1.04		1.04		
30	4.71		4.71			
		0.847		0.847		
32	3.70		3.70			
		0.634		0.634		
34	2.65		2.65			
		0.370		0.370		
36	0.551		0.551			
		0.009		0.009		
36.5	0.00		0.00			



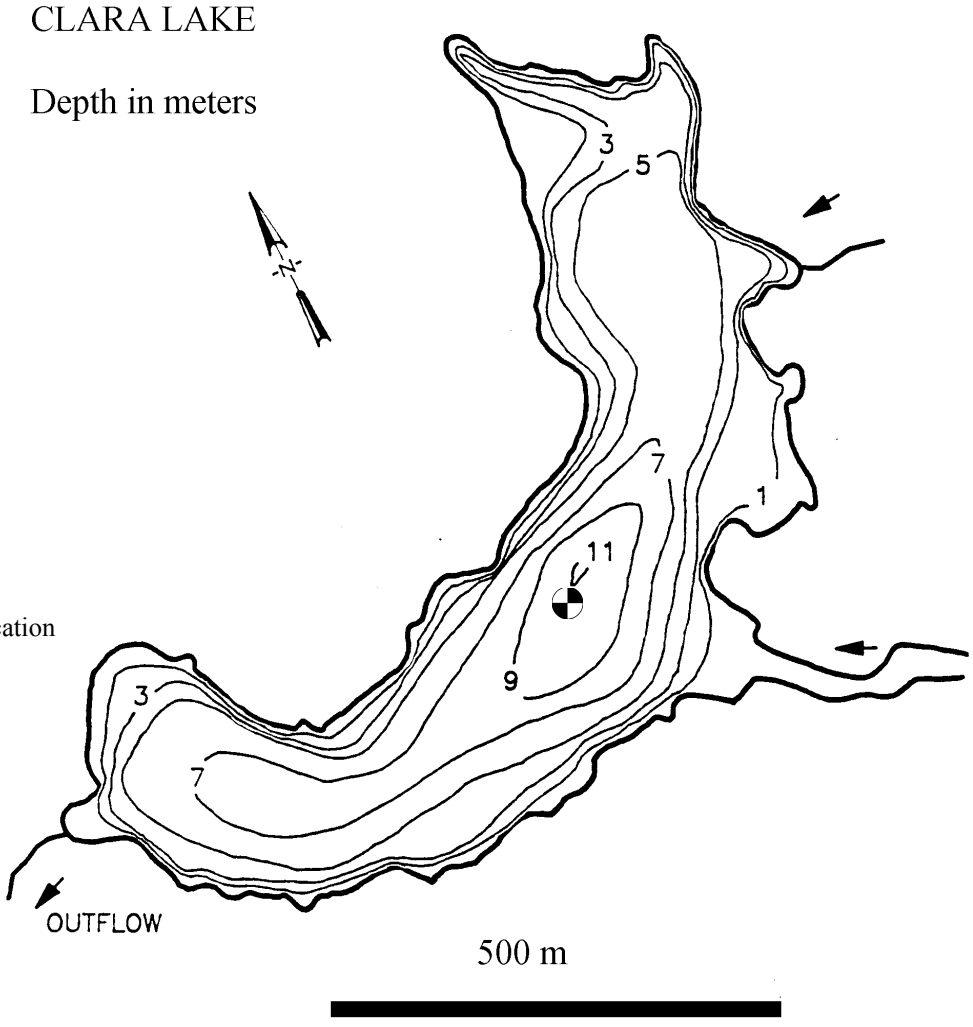
Secchi Disc = Chemistry sampling location

Clara Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
30.18	13.92	4.61	11.0	3.81	1.96	1.26

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	30.18	
		5.19
2	23.04	
		4.12
4	17.81	
		2.89
6	10.10	
		1.29
8	3.72	
		0.40
10	0.66	
		0.03
11	0.00	

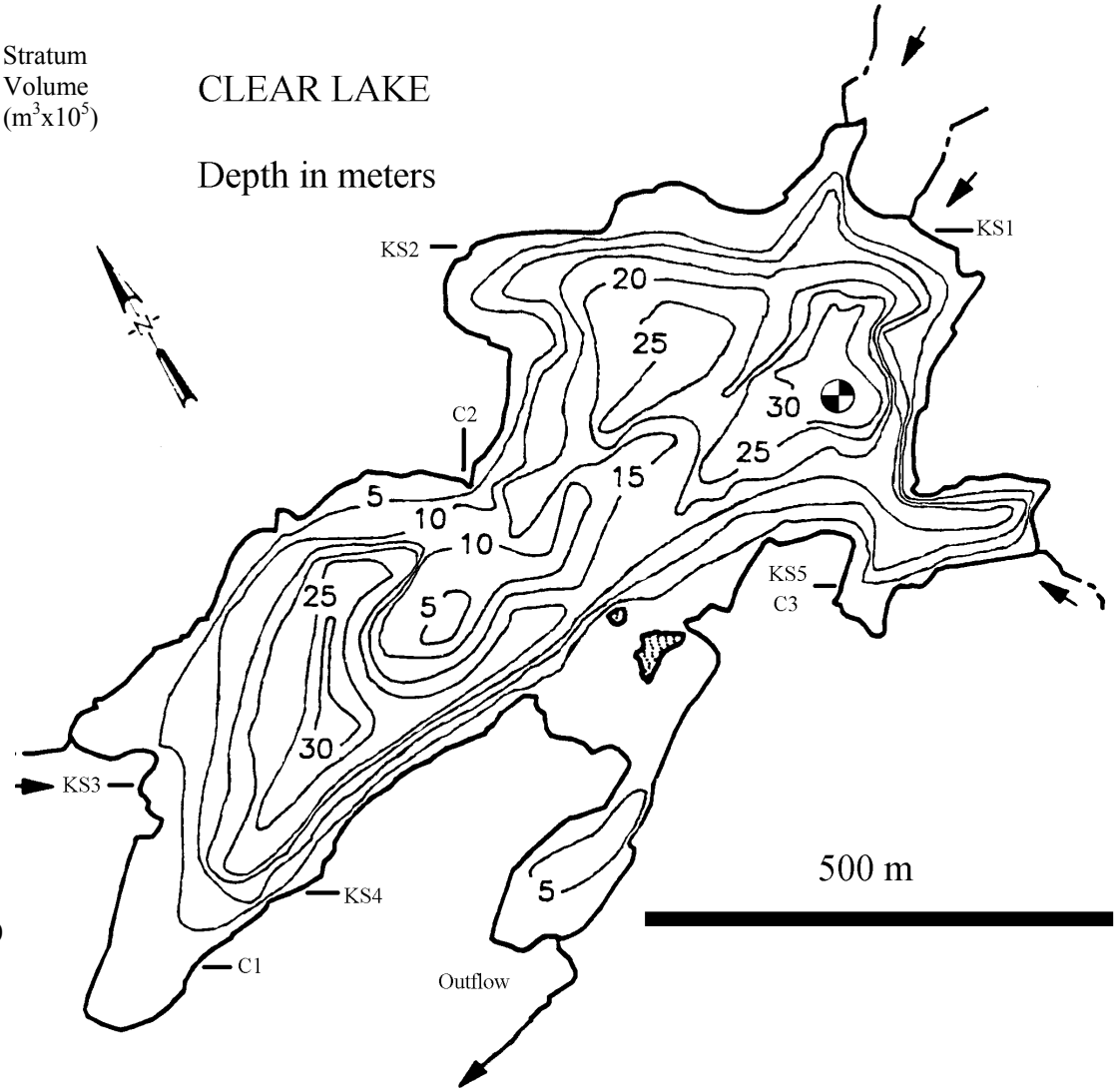
Secchi Disc = Chemistry sampling location



Clear Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
88.4	109.1	12.4	33.0	6.73	2.02	1.12

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	88.4	
		16.5
2	77.0	
		14.3
4	66.4	
		12.5
6	58.4	
		11.1
8	52.7	
		10.0
10	47.3	
		8.89
12	41.6	
		7.79
14	36.3	
		6.73
16	31.1	
		5.7
18	26	
		4.72
20	21.3	
		3.76
22	16.4	
		2.84
24	12.1	
		2.03
26	8.28	
		1.32
28	5.04	
		0.751
30	2.60	
		0.250
33	0.298	

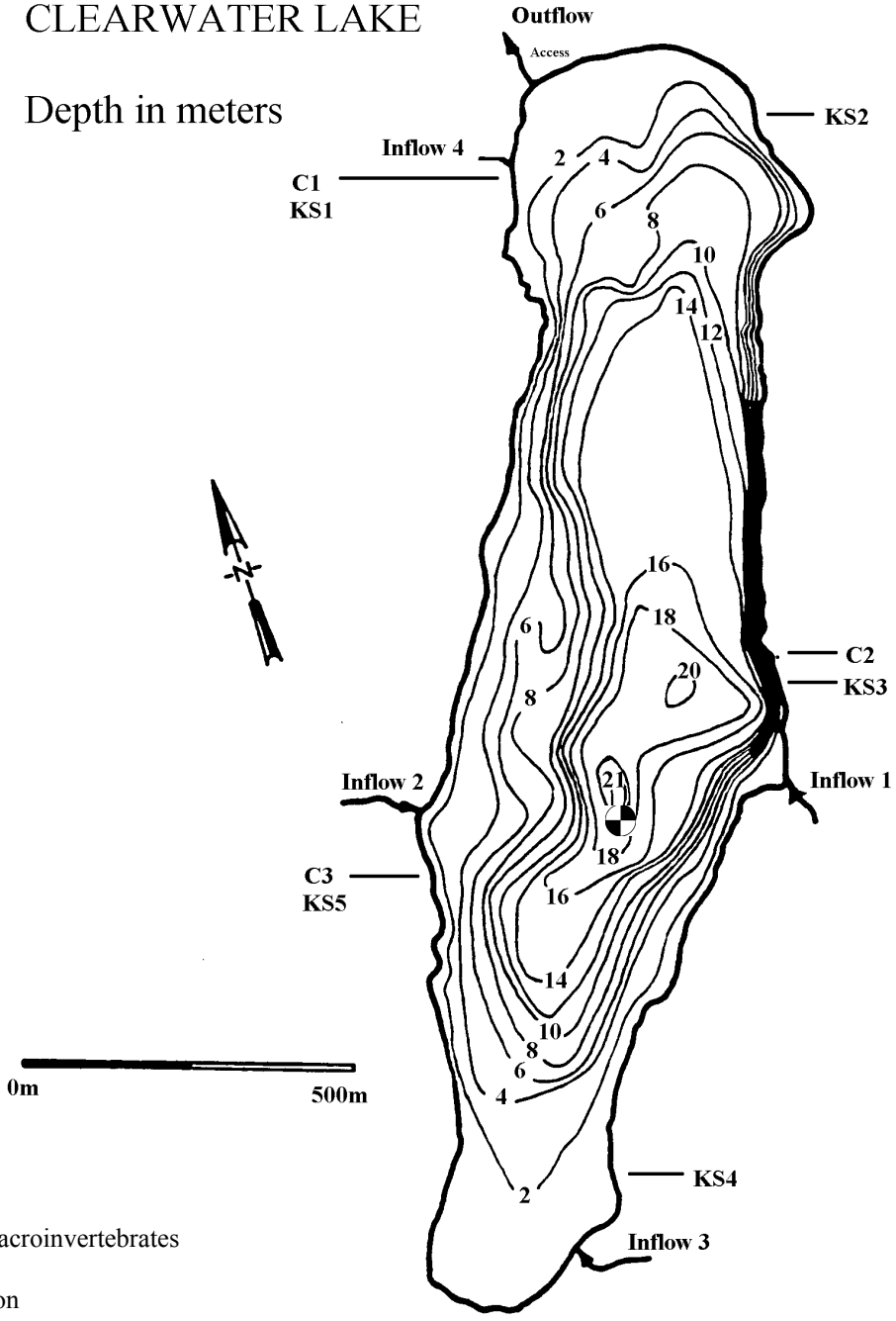


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi disc = Chemistry sampling site
Inflow # = inflowing streams

Clearwater Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
76.5	64.2	8.39	21.5	4.97	1.60	1.20

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	76.5	
		13.8
2	61.5	
		11.3
4	51.5	
		9.59
6	44.4	
		8.12
8	36.9	
		6.70
10	30.3	
		5.60
12	25.8	
		4.64
14	20.8	
		2.77
16	7.94	
		1.23
18	4.56	
		0.454
20	0.599	
		0.033
21	0.12	
		0.002
21.5	0.00	

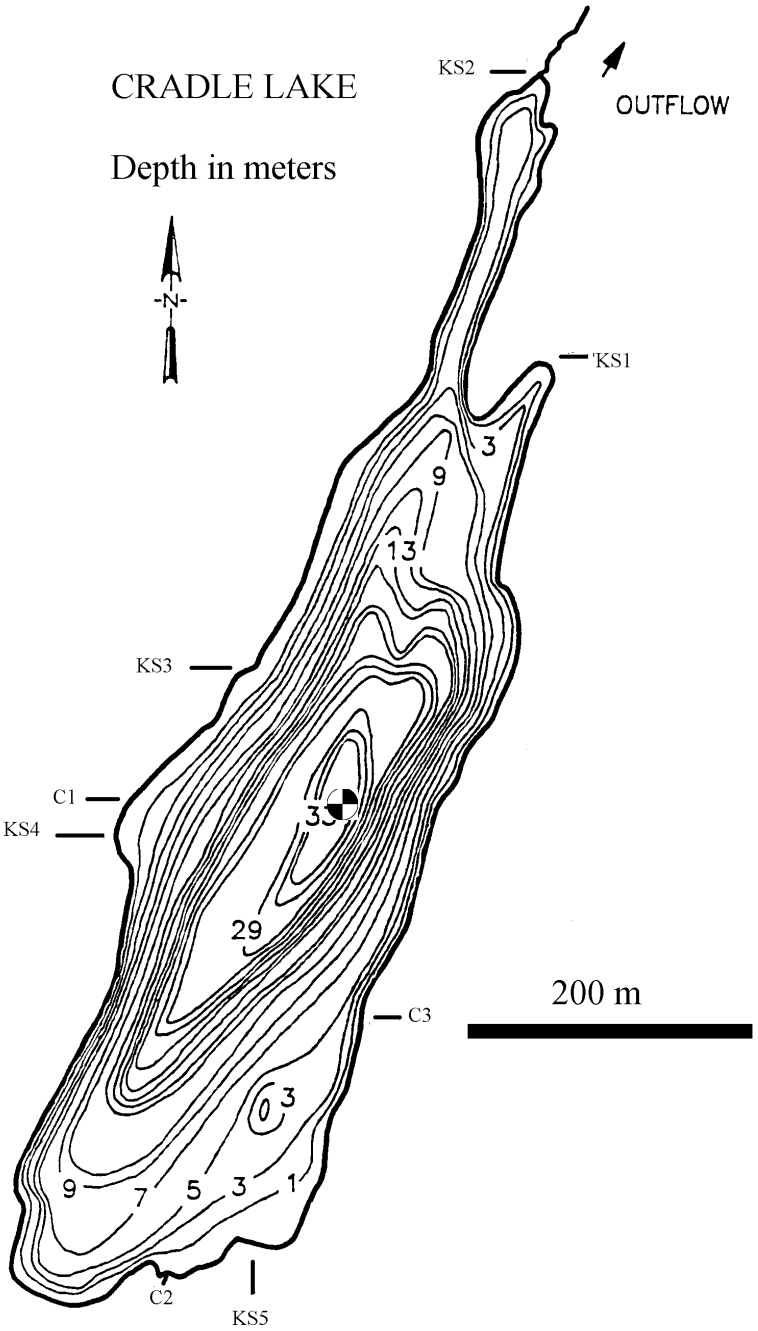


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Cradle Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
17.89	22.25	12.44	33.3	2.44	1.63	1.12

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	17.89	
		3.42
2	16.34	
		3.11
4	14.74	
		2.77
6	12.78	
		2.35
8	10.86	
		2.00
10	9.04	
		1.63
12	7.50	
		1.38
14	6.24	
		1.13
16	5.25	
		0.99
18	4.56	
		0.85
20	3.96	
		0.74
22	3.42	
		0.63
24	2.87	
		0.52
26	2.39	
		0.41
28	1.42	
		0.19
30	0.65	
		0.10
32	0.40	
		0.04
33.3	0.00	

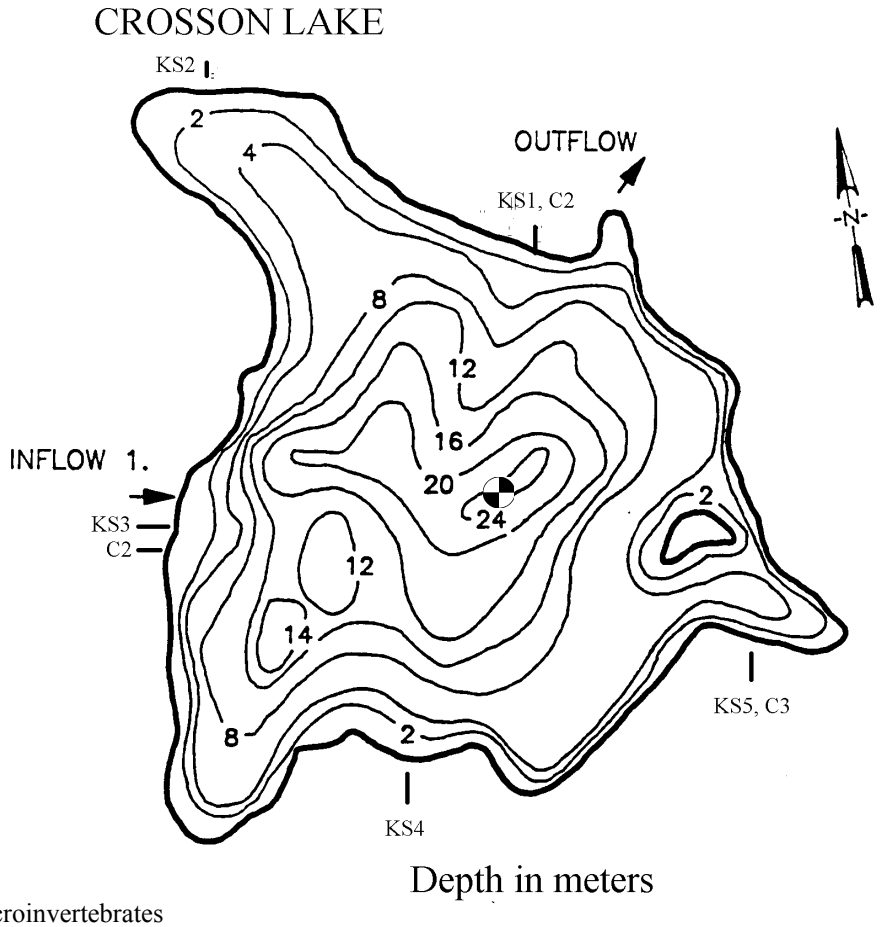


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Crosson Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
56.74	52.16	9.2	25.0	4.4	1.65	1.10

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	56.74	
		10.70
2	50.28	
		9.30
4	42.8	
		7.74
6	34.75	
		6.14
8	26.83	
		4.89
10	22.13	
		3.98
12	17.77	
		3.14
14	13.75	
		2.36
16	9.92	
		1.73
18	7.48	
		1.26
20	5.15	
		0.67
22	1.83	
		0.23
24	0.58	
		0.02
25	0.00	

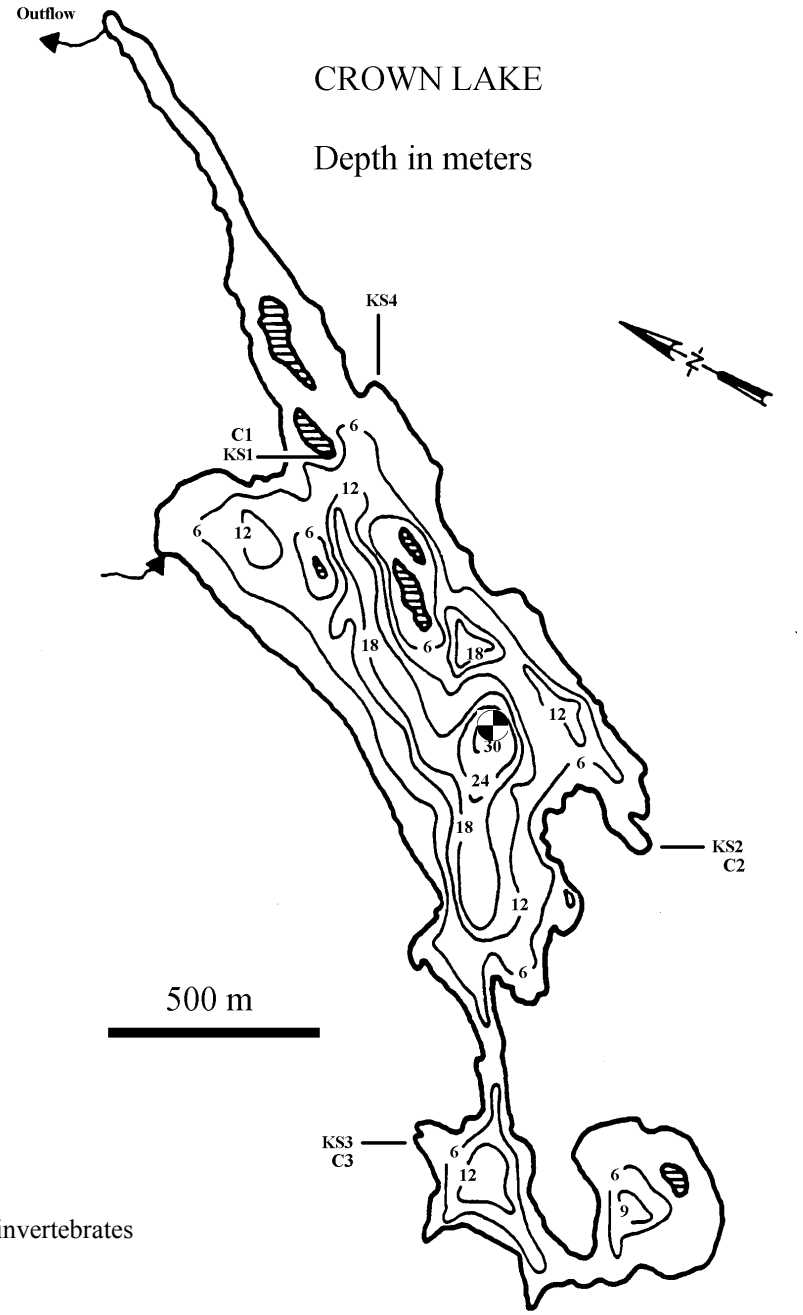


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Crown Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
136	108.4	8.0	30.0	10.01	2.42	0.80

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	136	
		25.0
2	114	
		20.7
4	93.7	
		16.9
6	75.5	
		13.2
8	56.7	
		9.67
10	40.5	
		6.72
12	27.1	
		4.84
14	21.4	
		3.78
16	16.4	
		2.84
18	12.1	
		2.00
20	8.01	
		1.26
22	4.76	
		0.697
24	2.35	
		0.392
26	1.59	
		0.255
28	0.98	
		0.147
30	0.516	

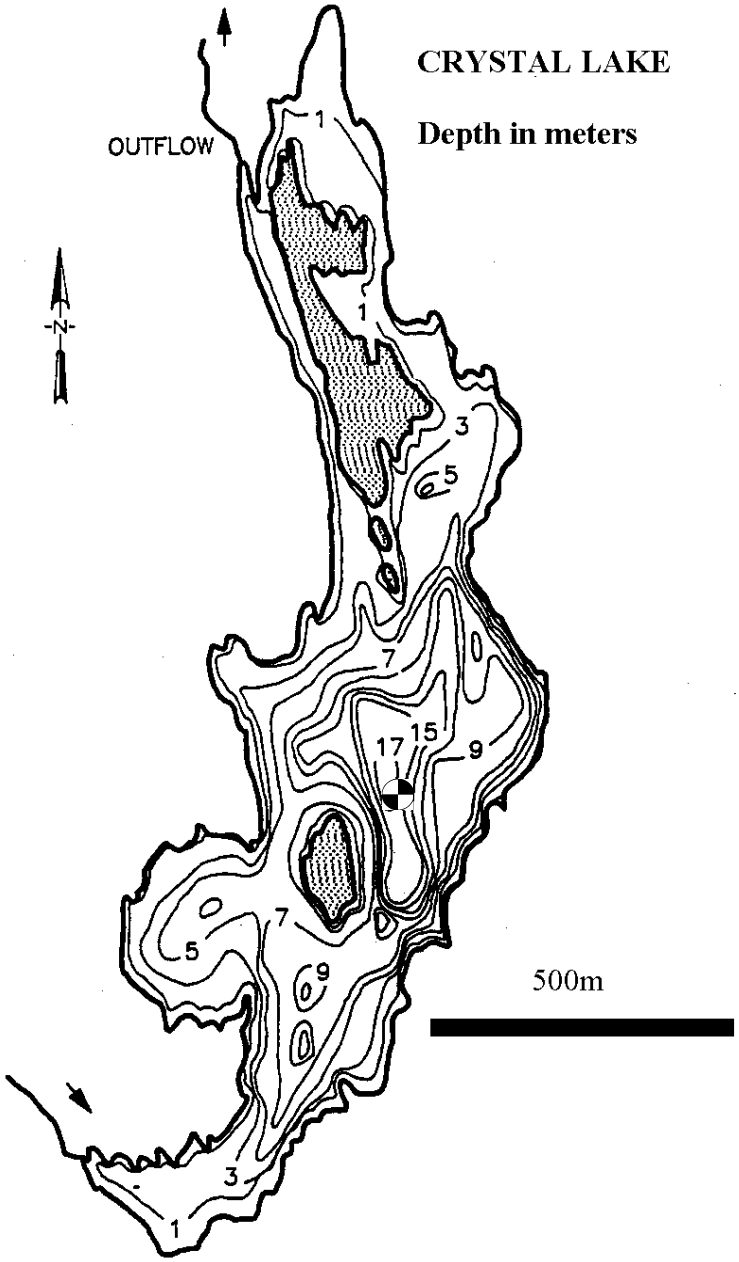


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Crystal Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_v
41.02	17.77	4.33	17.1	5.61	2.47	0.76

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	41.02	
		6.25
2	24.72	
		4.20
4	17.11	
		2.89
6	12.08	
		1.98
8	7.60	
		1.15
10	4.40	
		0.69
12	2.71	
		0.43
14	1.68	
		0.24
16	0.64	
		0.04
17.1	0.00	



Secchi Disc = Chemistry sampling location

Delano Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_v
23.9	17.04	7.13	18.6	1.99	1.15	1.14

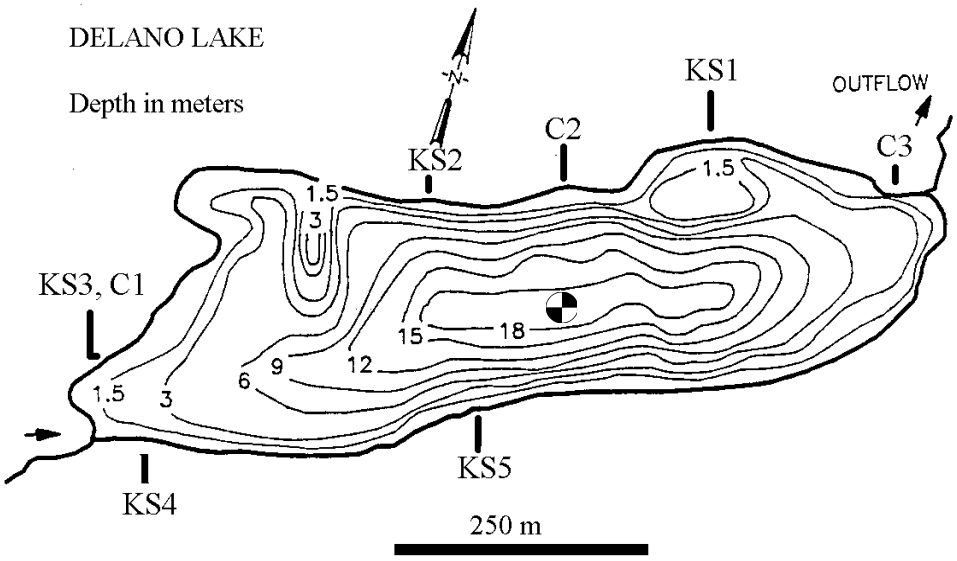
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	23.9	
		4.27
2	18.9	
		3.25
4	13.7	
		2.45
6	10.8	
		1.98
8	9.01	
		1.61
10	7.13	
		1.29
12	5.79	
		1.01
14	4.36	
		0.71
16	2.80	
		0.432
18	1.58	
		0.032
18.6	0.00	

KS = Kick and Sweep sites for benthic macroinvertebrates

C = Crayfish trap sampling sites

Secchi Disc = Chemistry sampling location

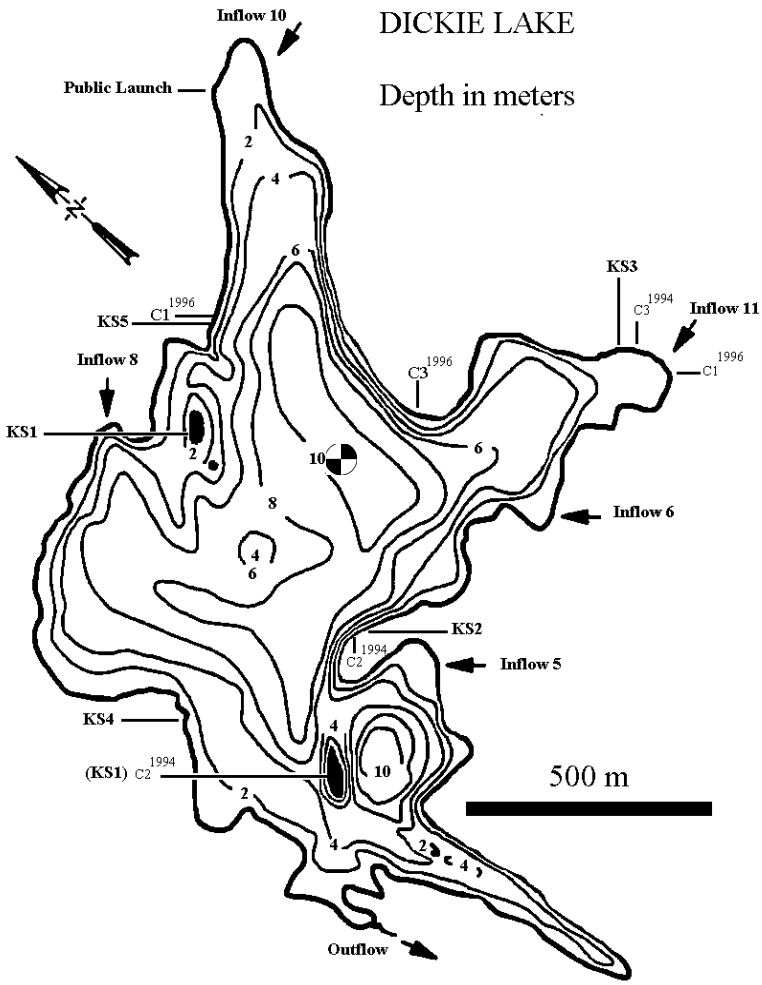
Inflow # = inflowing streams



Dickie Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
93.6	46.65	5.0	12.0	8.22	2.40	1.25

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	93.6	
		16.81
2	74.84	
		7.02
3	65.72	
		6.13
4	56.94	
		4.87
5	40.81	
		3.75
6	34.23	
		3.05
7	27.00	
		2.28
8	18.76	
		1.56
9	12.58	
		0.89
10	5.61	
		0.28
11	0.76	
		0.03
12	0.00	



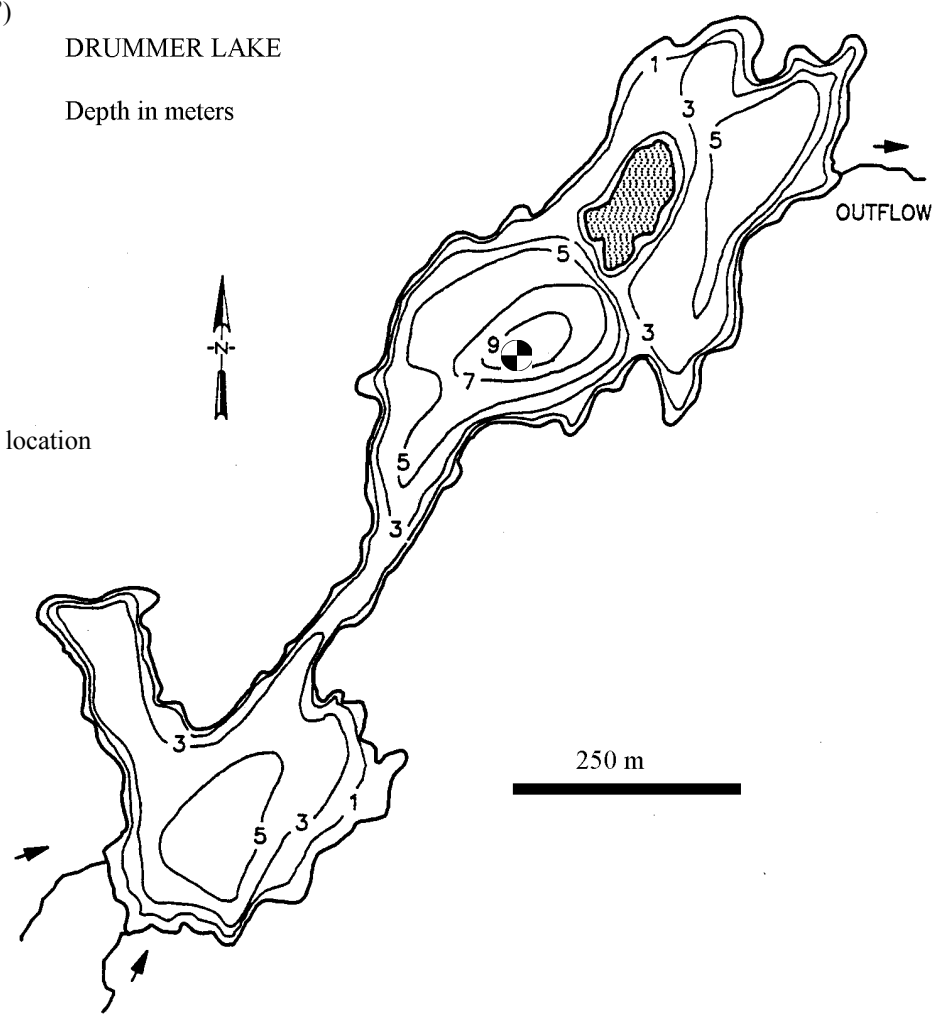
KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Drummer Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
24.17	8.75	3.62	10.2	4.44	2.55	1.07

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	24.17	
		4.10
2	17.43	
		2.86
4	10.33	
		1.35
6	3.55	
		0.35
8	0.87	
		0.08
10.2	0.00	

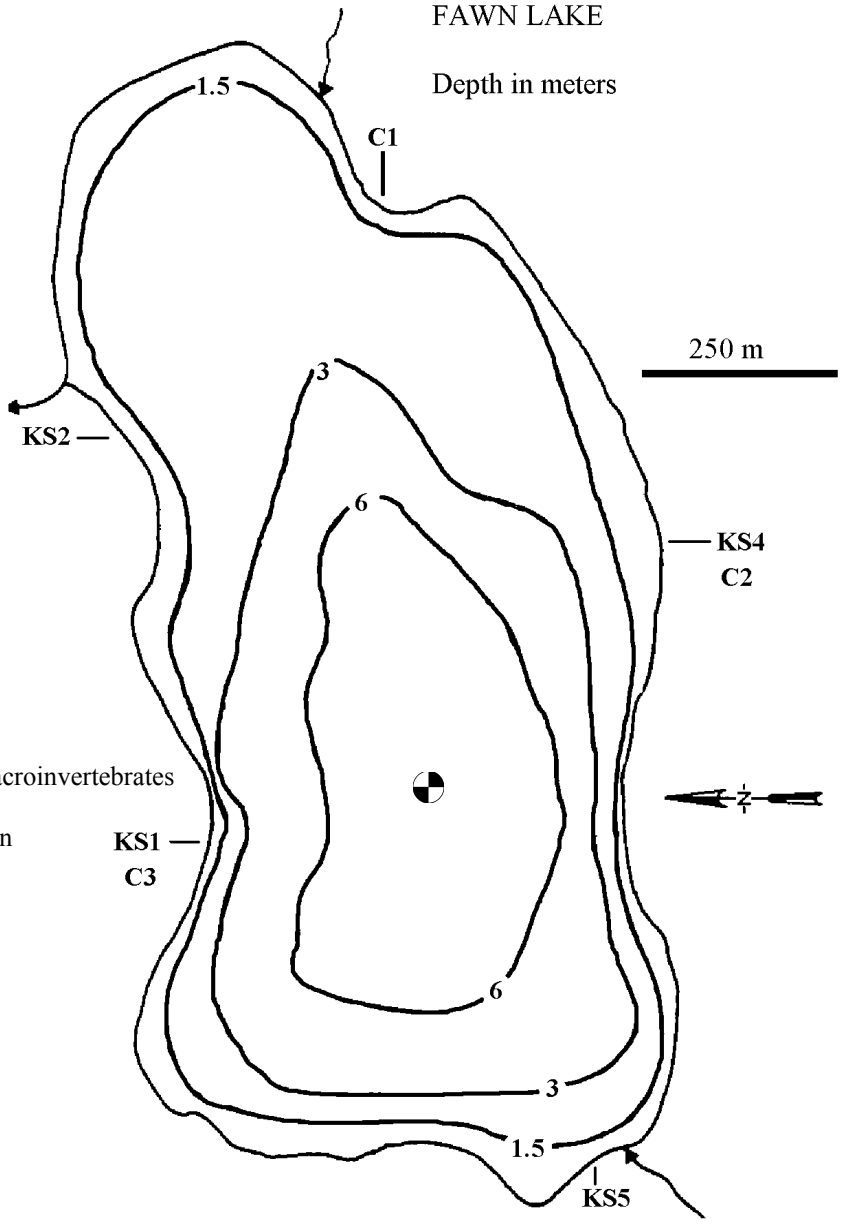
Secchi Disc = Chemistry sampling location



Fawn Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
85.8	30.2	3.5	7.92	4.08	1.24	1.34

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	85.8	
		15.3
2	73.1	
		8.68
4	39.8	
		4.94
6	17.6	
		1.24
7.9	0.00	

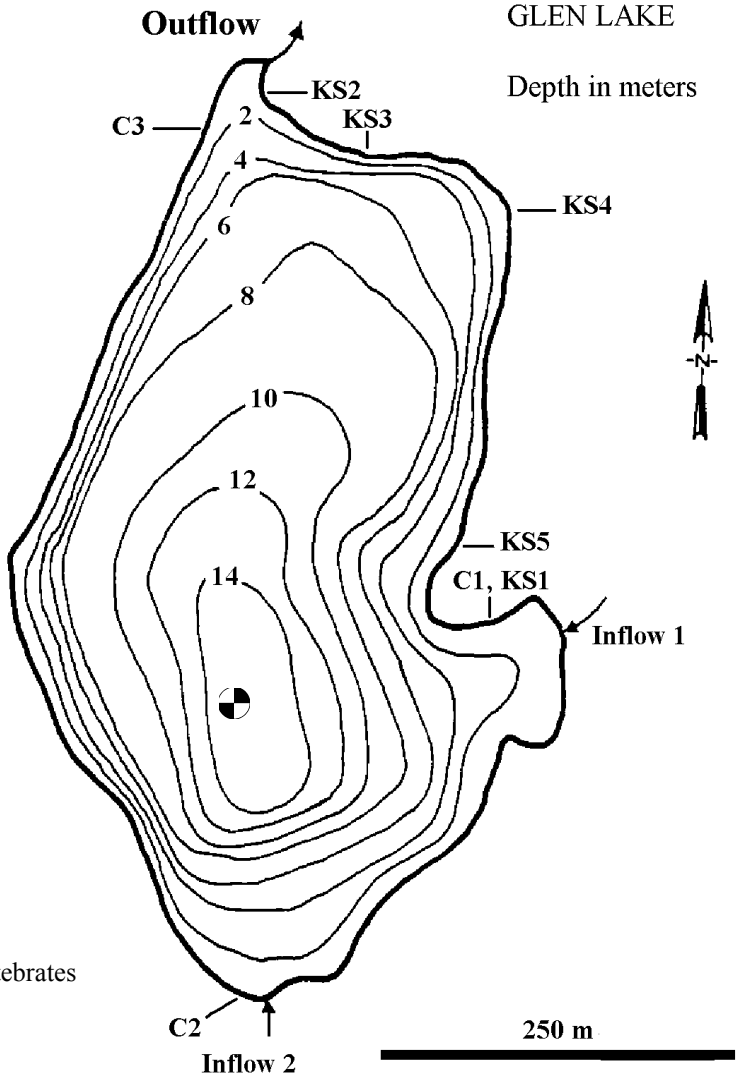


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Glen Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
16.3	11.8	7.2	15.0	1.83	1.28	1.44

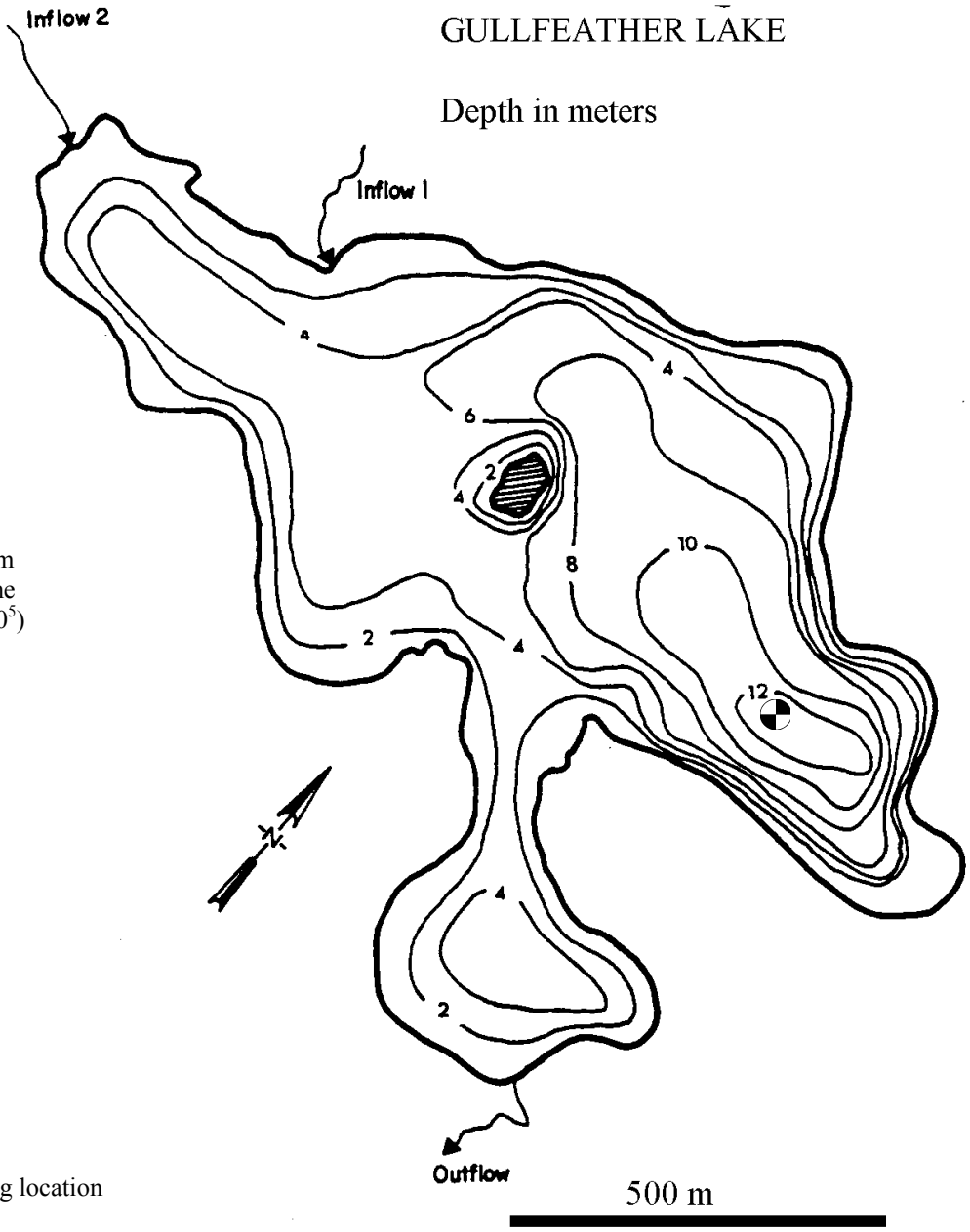
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	16.3	
		3.02
2	13.9	
		2.59
4	12.0	
		2.21
6	10.1	
		1.79
8	7.81	
		1.17
10	4.13	
		0.638
12	2.34	
		0.321
14	0.976	
		0.032
15	0.00	



KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Gullfeather Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
65.9	31.5	4.8	13.0	5.26	1.83	1.11



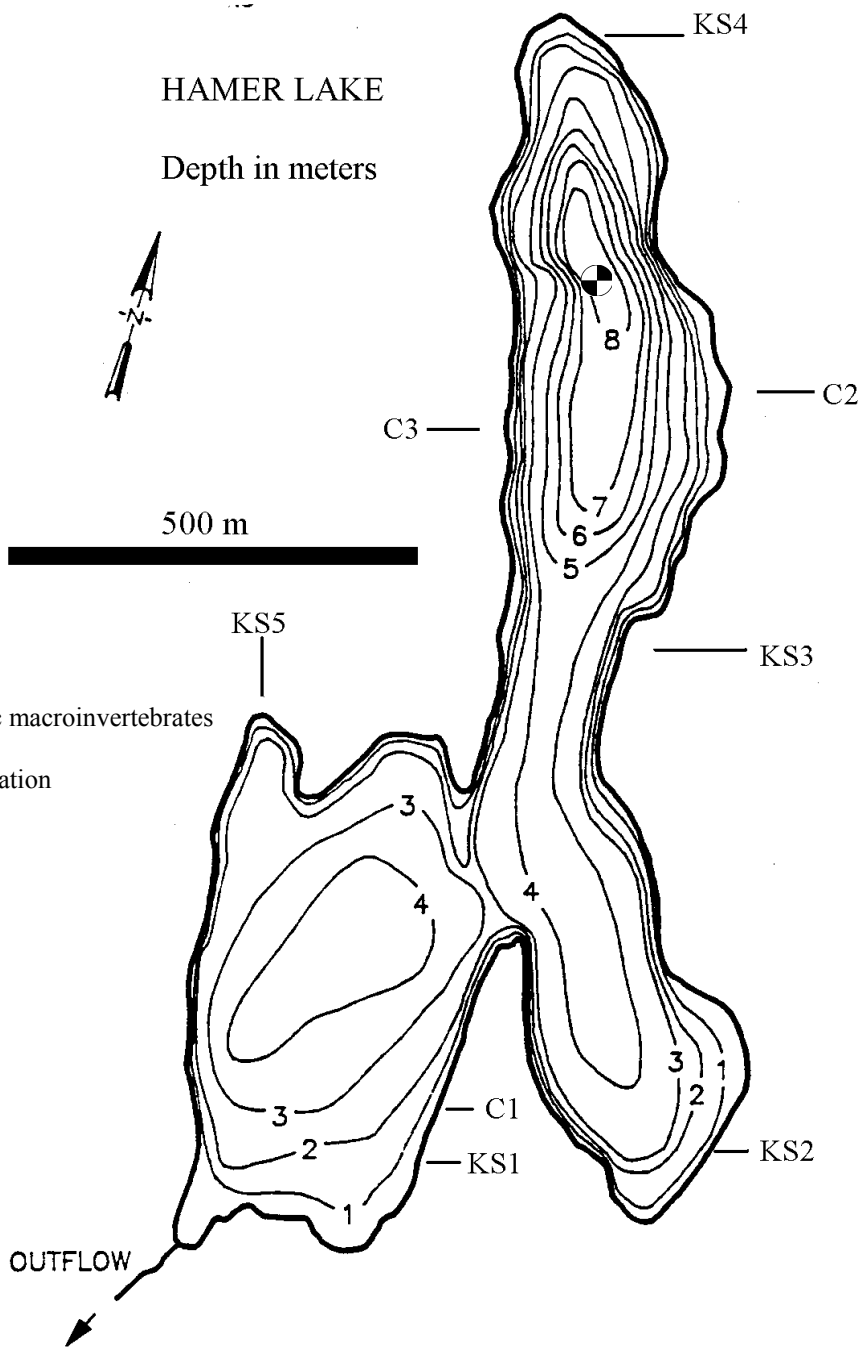
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	65.9	
		11.6
2	50.8	
		8.75
4	37.1	
		5.63
6	20.1	
		3.25
8	12.6	
		1.66
10	4.66	
		0.533
12	1.09	
		0.036
13	0.00	

Secchi Disc = Chemistry sampling location

Hamer Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
35.21	11.63	3.3	8.5	4.04	1.92	1.17

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	35.21	
		6.199
2	26.84	
		3.928
4	11.19	
		1.118
6	3.109	
		0.385
8.5	0.00	

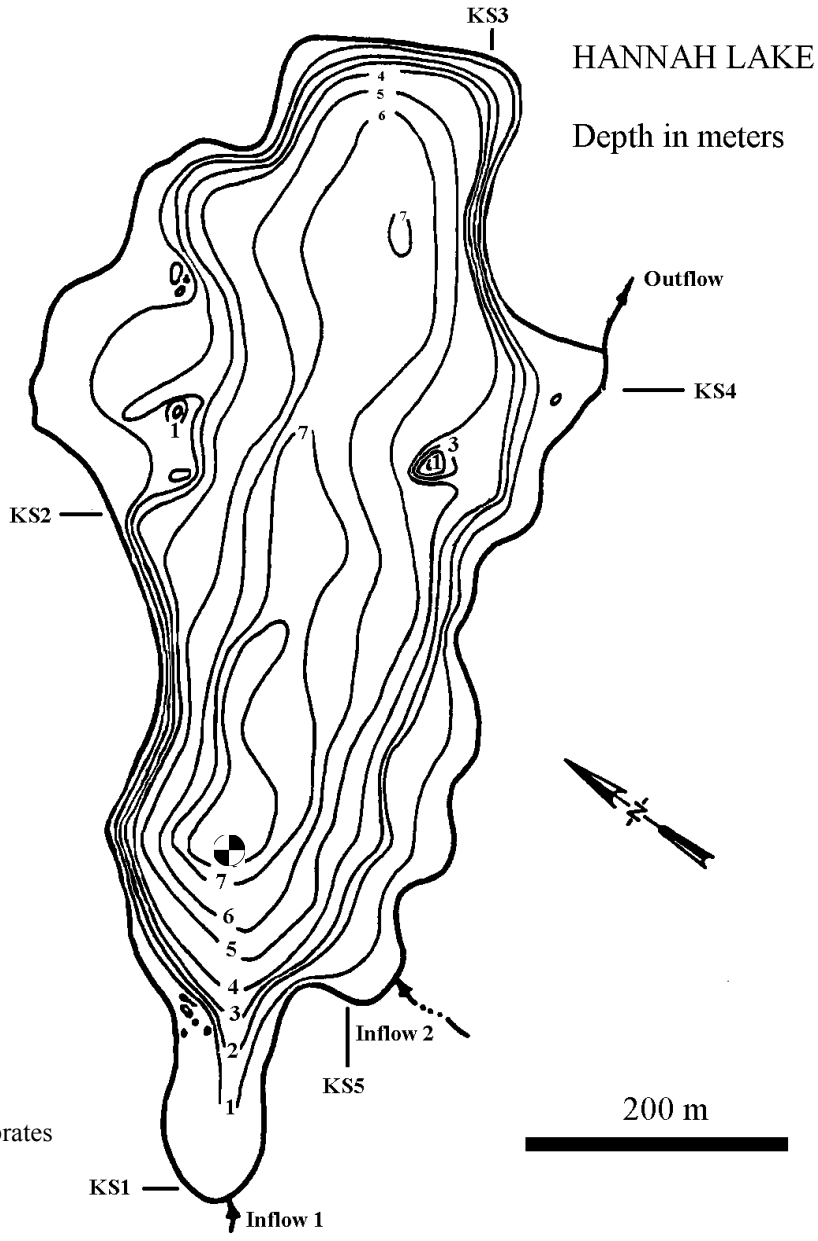


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Hannah Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
27.3	10.8	3.97	8.5	2.7	1.46	1.40

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	27.30	
		2.46
1	22.08	
		2.06
2	19.14	
		1.83
3	17.48	
		1.63
4	15.18	
		1.30
5	11.02	
		0.895
6	7.03	
		0.472
7	2.74	
		0.166
8	0.78	
		0.013
8.5	0.00	

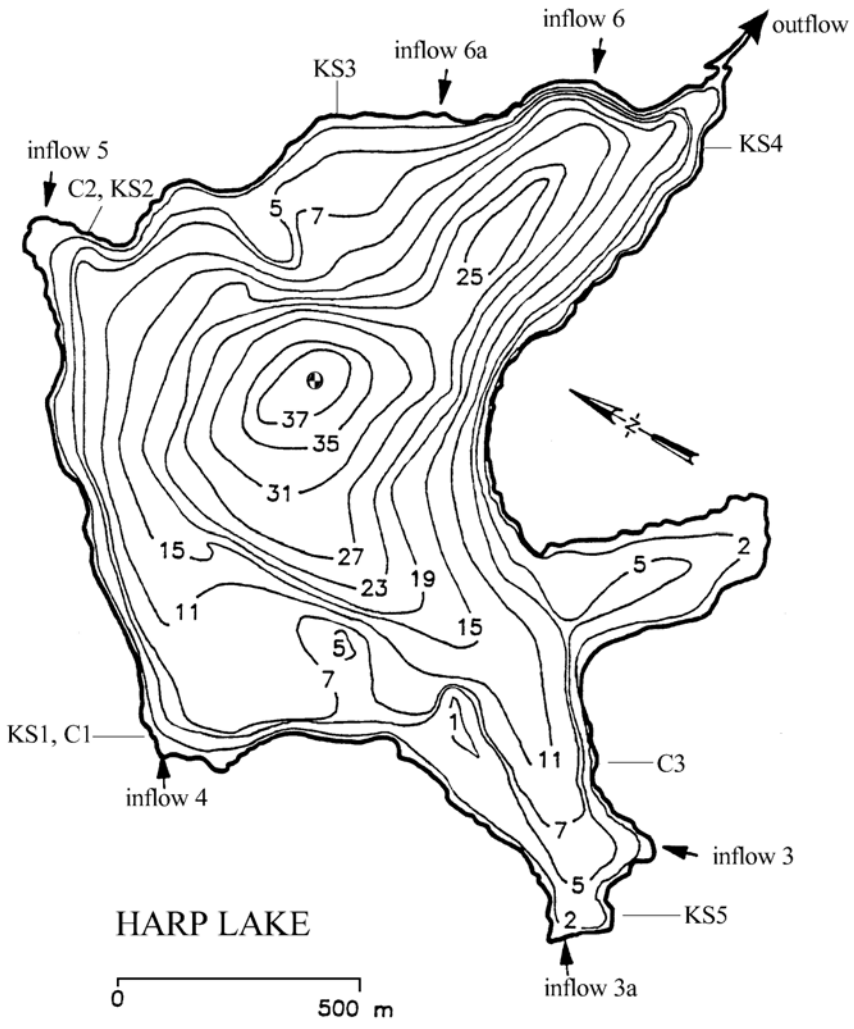


KS = Kick and Sweep sites for benthic invertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Harp Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
71.38	95.07	13.32	37.5	4.75	1.59	0.93

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	71.38	
		13.75
2	66.1	
		12.43
4	58.64	
		11.06
6	51.73	
		9.64
8	44.77	
		8.29
10	38.13	
		7.02
12	32.47	
		6.02
14	27.85	
		5.16
16	23.93	
		4.45
18	20.61	
		3.82
20	17.69	
		3.28
22	15.2	
		2.79
24	12.43	
		2.19
26	9.69	
		1.71
28	7.42	
		1.29
30	5.62	
		0.97
32	3.99	
		0.65
34	2.64	
		0.42
36	1.48	
		0.14
37.5	0.00	



KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi disc = Chemistry sampling site
Inflow # = inflowing streams

Healey Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
122.0	33.7	2.8	7.0	7.48	1.91	1.19

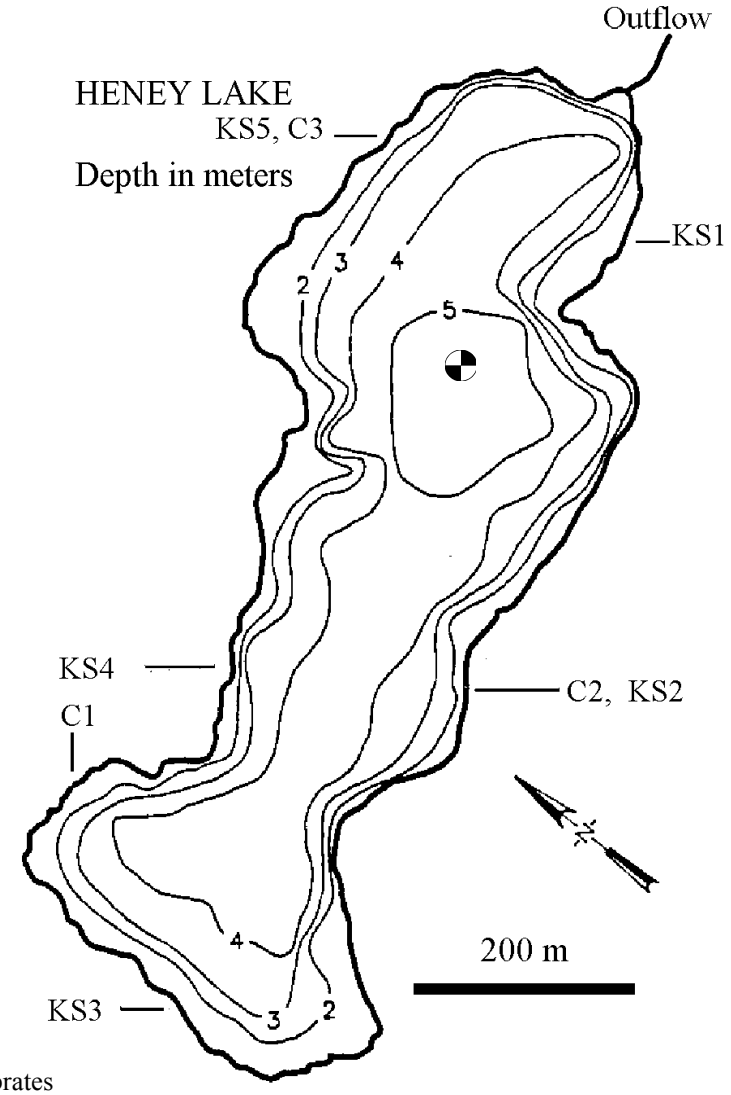
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	122.0	
		19.2
2	73.4	
		11.1
4	33.6	
		3.36
6	4.48	
		0.151
7	0.00	

Secchi Disc = Chemistry sampling location

Heney Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
21.37	7.05	3.29	5.8	2.72	1.66	1.70

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	21.37	
		2.02
1	19.04	
		1.79
2	16.84	
		1.55
3	14.23	
		1.14
4	8.79	
		0.53
5	1.81	
		0.05
5.8	0.00	

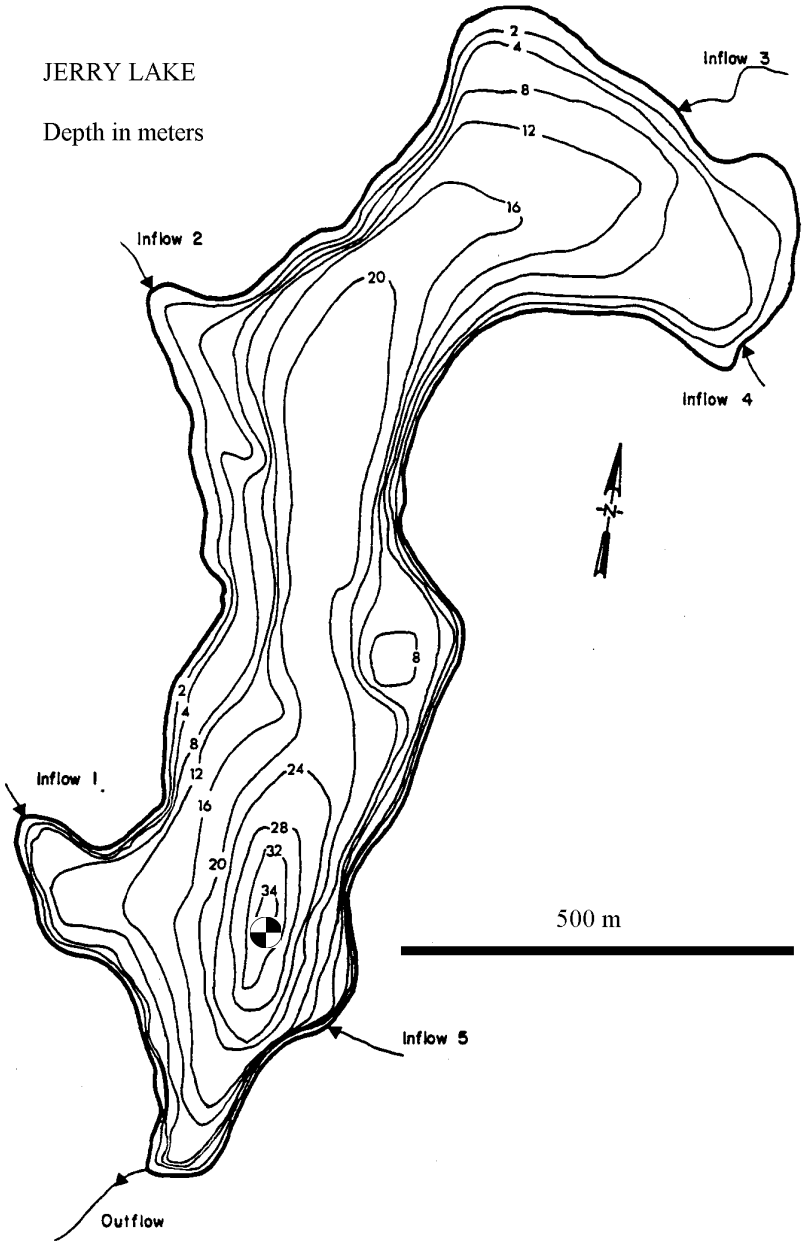


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Jerry Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
50.1	61.9	12.4	35.0	4.6	1.83	1.06

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	50.1	
		9.51
2	45.0	
		8.54
4	40.5	
		14.5
8	32.3	
		11.4
12	24.8	
		8.39
16	17.3	
		3.13
18	14	
		2.41
20	10.2	
		2.57
24	3.28	
		0.955
28	1.59	
		0.433
32	0.64	
		0.070
34	0.125	
		0.004
35	0.00	

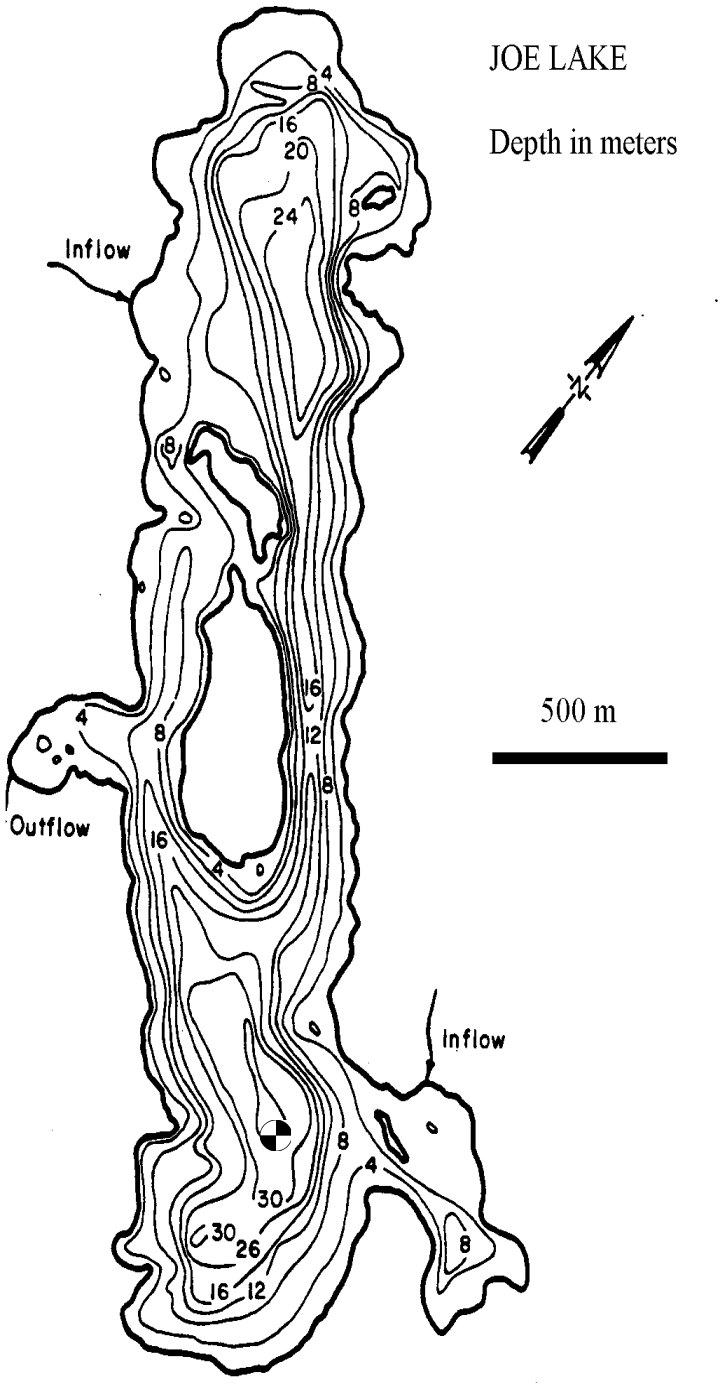


Secchi Disc = Chemistry sampling location

Joe Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
179.6	201.0	11.2	34	14.2	2.99	0.99

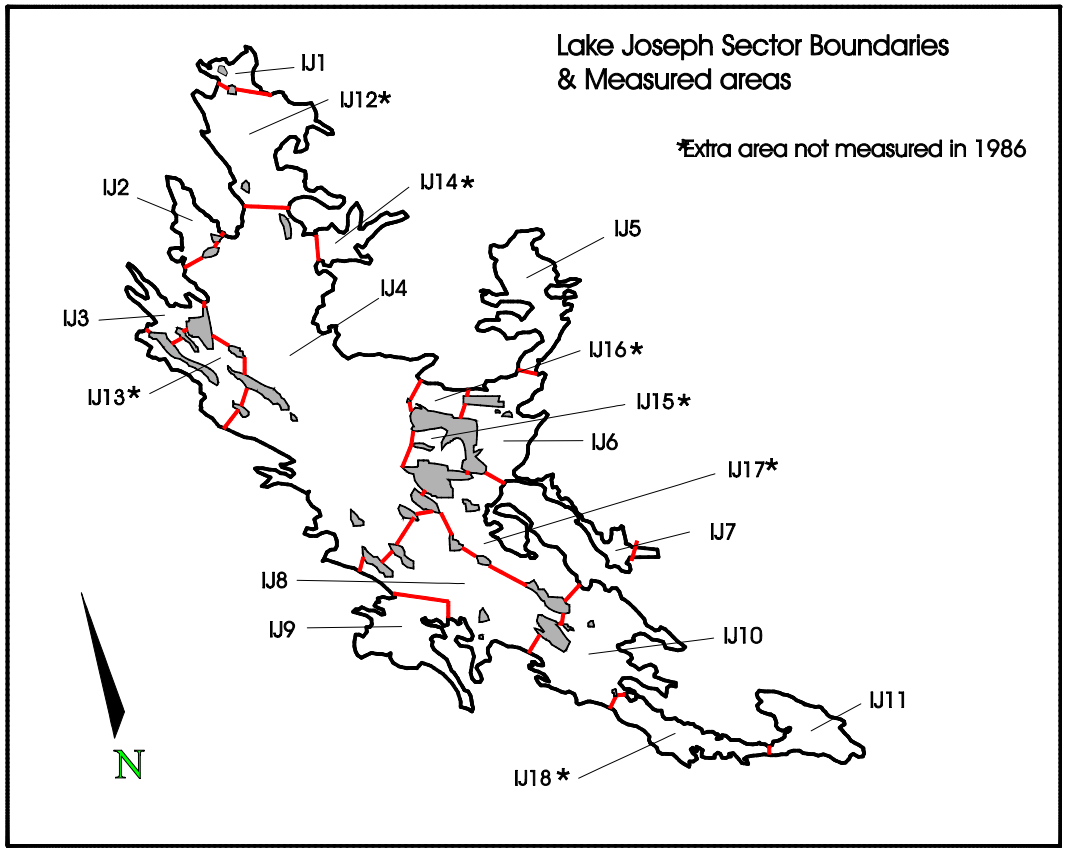
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	179.6	
		32.8
2	149.1	
		27.5
4	126.4	
		23.4
6	107.6	
		20.0
8	92.7	
		17.2
10	79.4	
		14.7
12	67.9	
		12.7
14	58.7	
		11.0
16	51.2	
		9.61
18	45.0	
		8.35
20	38.6	
		6.99
22	31.4	
		5.59
24	24.6	
		4.11
26	16.8	
		2.88
28	12.1	
		2.09
30	8.86	
		1.52
32	6.45	
		0.68
34	1.12	
		0.037
35	0.00	



Secchi Disc = Chemistry sampling location

Joseph Lake morphometry summary

Revised multi basin morphometric data also presented in Table 8

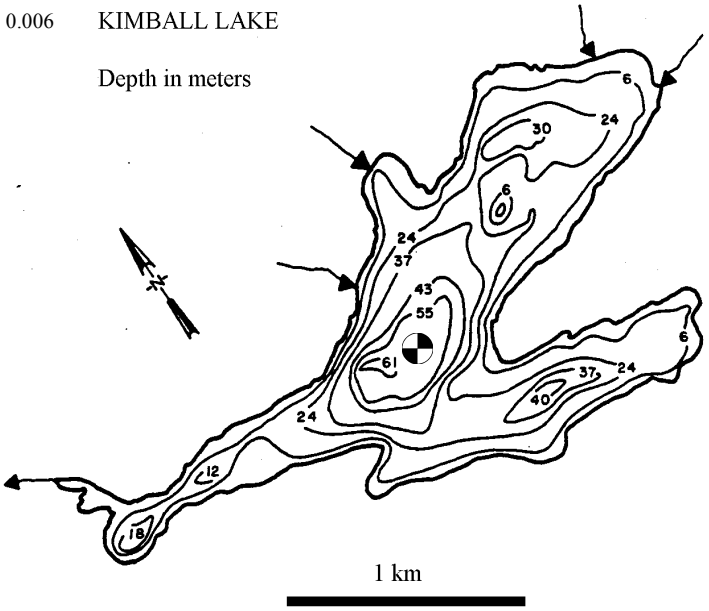


Station No.	Station Name	Corrected Areas (ha)	Mean Depth (m)	Maximum Depth (m)	Volume (m^3 x10^5)
Lake Joseph		5,375.05	24.7	82.9	13,296.1
IJ1	Frazer Island	75.81	10.4	29.0	78.5
IJ2	Hamer Bay	115.43	17.8	46.9	205.6
IJ3	Gordon Bay	99.42	12.3	35.1	122.7
IJ4	Yoho Island	1,737.27	36.8	82.9	6399.0
IJ5	Little Lake Joseph	294.98	16.0	38.7	470.8
IJ6	Chief's Island	237.75	8.8	18.9	209.4
(IJ7)	(Joseph River)	(74.85)	3.4	7.6	25.1
IJ8	Badgerow Island	510.61	17.2	37.5	878.7
IJ9	Footes Bay	243.28	16.2	36.6	394.7
IJ10	Black Forest Island	424.86	11.2	26.2	474.5
IJ11	Cox Bay	184.40	7.0	14.0	129.9
IJ12 (extra)	Burnegie Bay	455.62			
IJ13 (extra)	Playfair Island	260.00			
IJ14 (extra)	Stanley Bay	102.50			
IJ15 (extra)	Little Chief's Bay	78.75			
IJ16 (extra)	Ladies Bay	44.37			
IJ17 (extra)	Loon Island	326.25			
IJ18 (extra)	Crane Island	183.75			
(extra)=areas not included in DR90/4 (1986)					
Total Surface Area		5,375.05			
Joe River Area		74.85			
Lake Area plus River Area		5,449.90			

Kimball Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
212.6	464.2	21.8	65.5	10.84	2.09	1.08

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	212.6				5.02
		41.2	42	27.4	
2	199.8				4.2
		38.7	44	22.9	
4	187.4				4.2
		36.3	46	18.8	
6	175.4				3.39
		33.9	48	15.2	
8	163.8				2.7
		31.6	50	11.9	
10	152.6				2.09
		29.4	52	9.03	
12	141.8				1.55
		27.3	54	6.55	
14	131.4				1.10
		25.3	56	4.47	
16	121.4				0.72
		23.3	58	2.79	
18	111.8				0.42
		21.4	60	1.5	
20	102.6				0.20
		19.6	62	0.61	
22	93.8				0.07
		17.9	64	0.112	
24	85.3				0.006
		16.3	65.5		
26	77.3				
		14.7			
28	69.7				
		13.2			
30	62.5				
		11.8			
32	55.6				
		10.5			
34	49.2				
		9.2			
36	43.1				
		8.1			
38	37.5				
		7.0			
40	32.2				

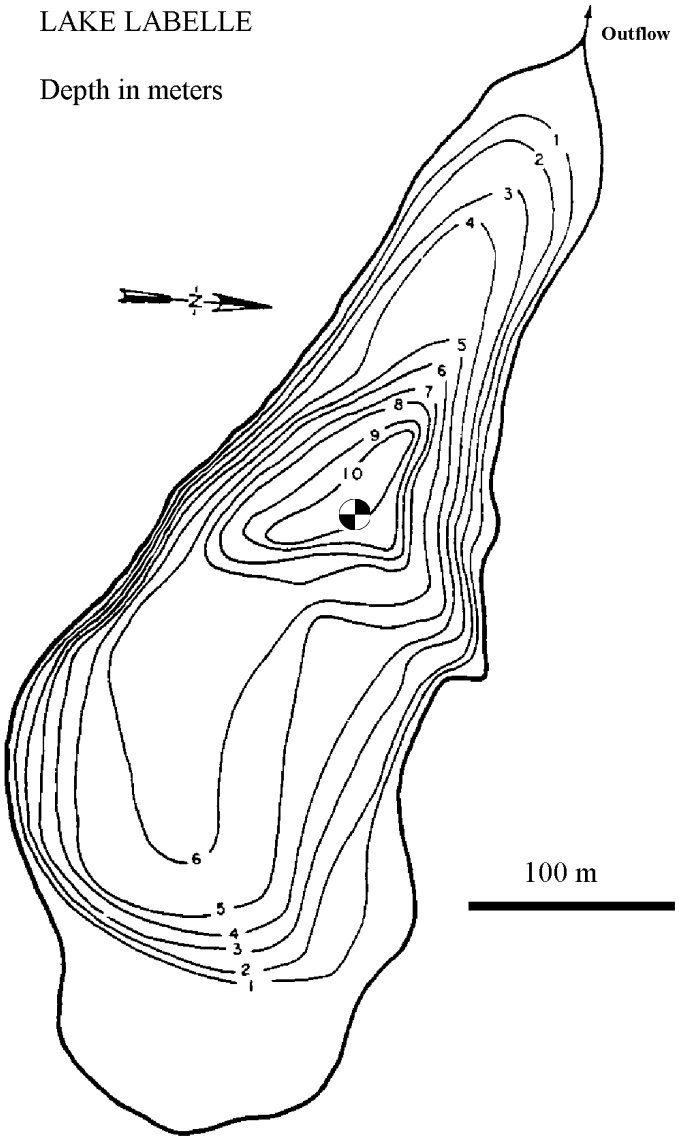


Secchi Disc = Chemistry sampling location

Labelle Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
6.16	2.36	3.84	10.2	1.32	1.50	1.18

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	6.16	
		0.542
1	4.71	
		0.446
2	4.21	
		0.392
3	3.65	
		0.336
4	3.08	
		0.267
5	2.29	
		0.185
6	1.45	
		0.097
7	0.559	
		0.048
8	0.413	
		0.033
9	0.246	
		0.018
10	0.115	
		0.001
10.2	0.00	



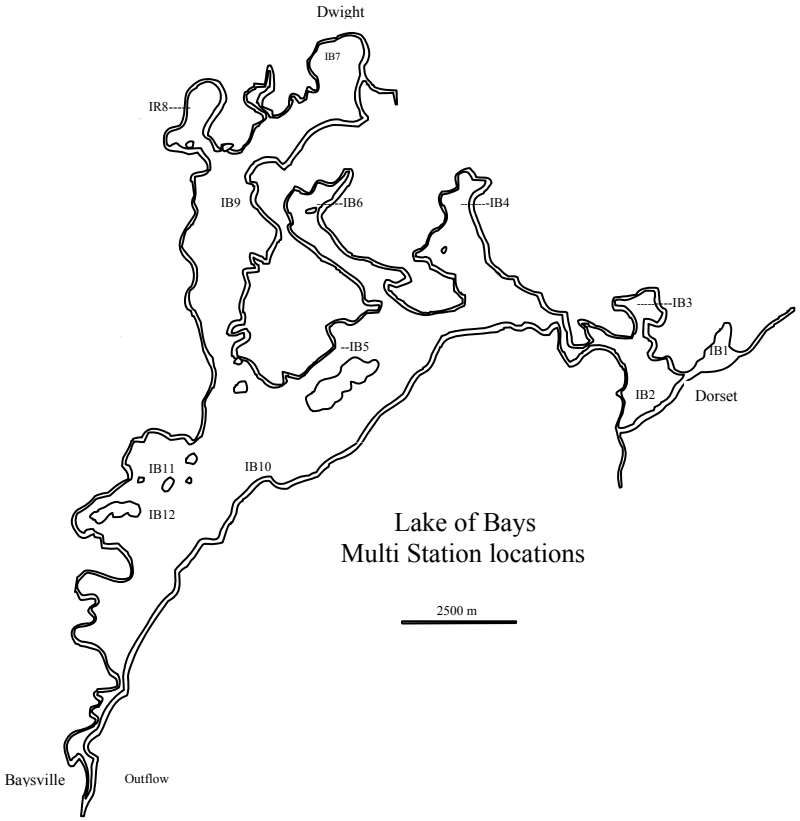
Secchi Disc = Chemistry sampling location

Lake of Bays morphometry summary

Revised multi basin morphometric data also presented in Table 8

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)
6860.81	15003.51	23.37	79.25

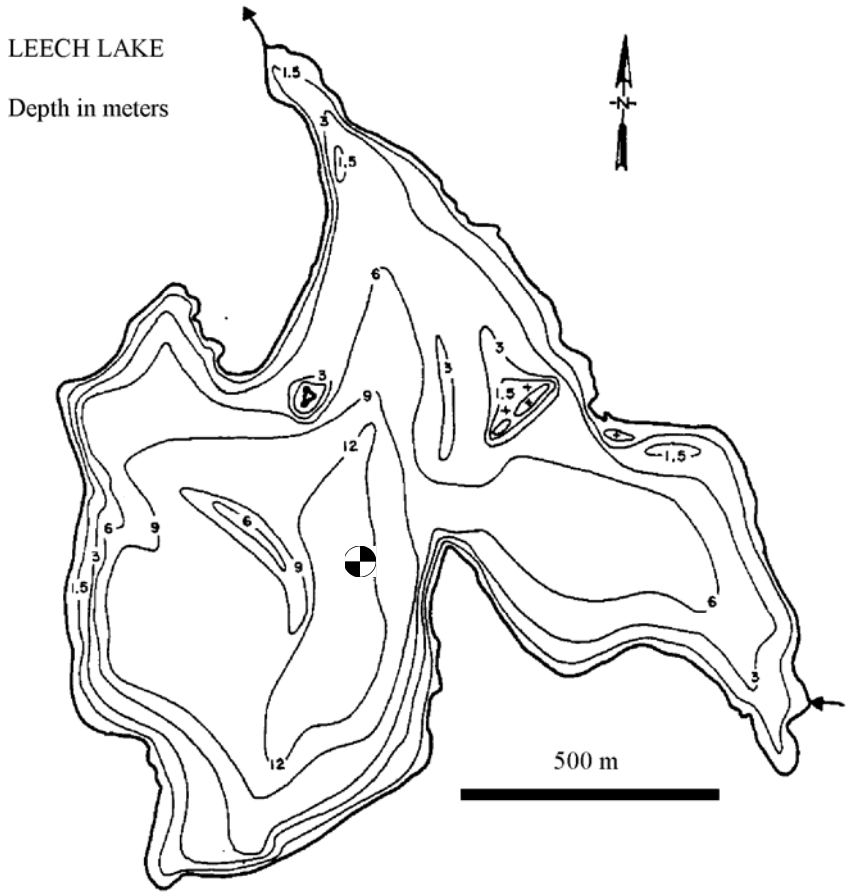
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	6860.81		28	2365.61		56	196.89	
		2490.28			866.20			63.01
4	5744.45		32	1973.44		60	23.35	
		2140.34			719.49			38.25
8	4977.87		36	1633.09		64	70.86	
		1863.47			560.69			20.83
12	4369.00		40	1160.73		68	36.26	
		1639.33			384.00			9.95
16	3837.23		44	778.34		72	15.04	
		1432.78			253.18			3.31
20	3312.97		48	505.30		76	3.02	
		1221.84			162.06			9.03
24	2809.62		52	317.09		79.25	0.00	
		1033.28			100.89			



Leech Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
82.0	51.9	6.3	13.7	5.7	1.78	1.38

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	82.0	
		15.6
2	70.5	
		12.6
4	55.5	
		9.69
6	41.7	
		6.97
8	28.4	
		4.48
10	16.2	
		2.15
12	6.17	
		0.366
13.7	0.00	

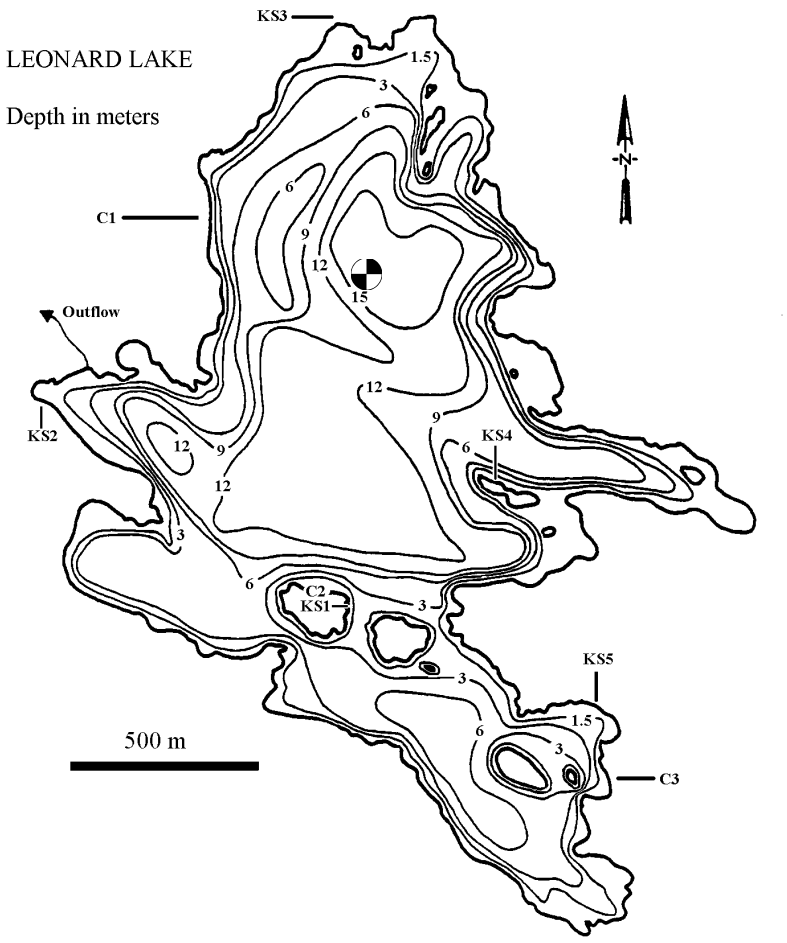


Secchi Disc = Chemistry sampling location

Leonard Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
195.0	134.0	6.9	15.2	14.0	2.83	1.36

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	195.0	
		35.0
2	156.0	
		28.2
4	126.0	
		22.0
6	94.9	
		17.1
8	76.1	
		13.6
10	59.7	
		10.5
12	45.3	
		6.29
14	19.4	
		1.67
15.2	8.28	

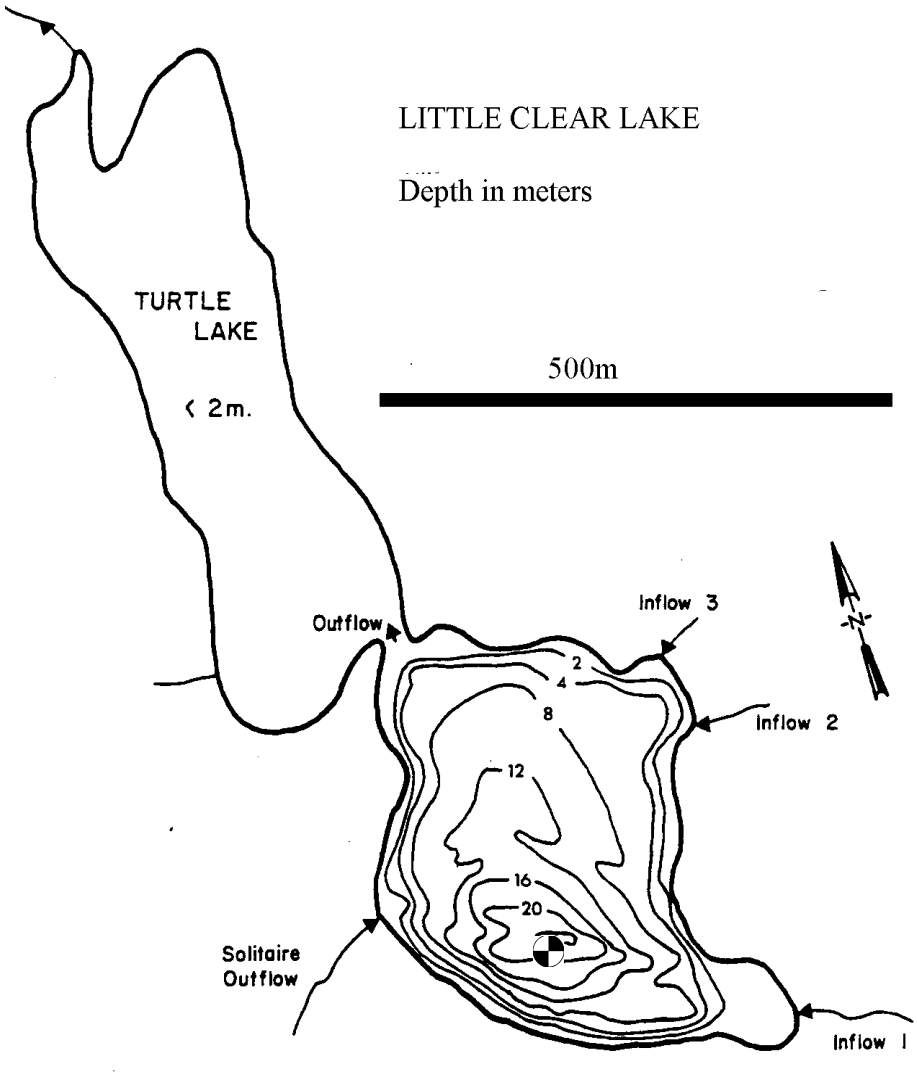


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Little Clear Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
10.9	8.9	8.1	25.0	1.48	1.26	0.97

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	10.9	
		1.99
2	8.99	
		1.69
4	7.97	
		1.45
6	6.51	
		1.19
8	5.39	
		0.905
10	3.71	
		0.613
12	2.46	
		0.395
14	1.52	
		0.254
16	1.0	
		0.175
18	0.72	
		0.116
20	0.448	
		0.064
22	0.208	
		0.02
24	0.024	
		0.001
25	0.00	

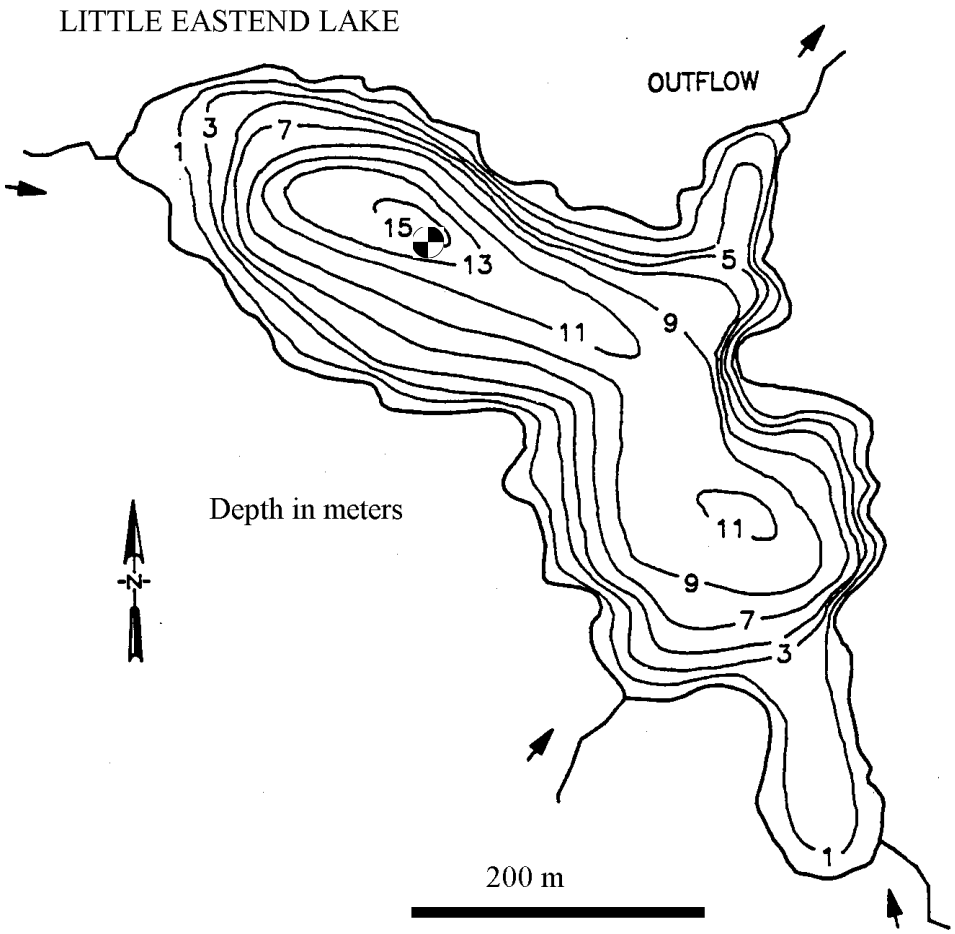


Secchi Disc = Chemistry sampling location

Little Eastend Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
11.67	7.05	6.04	15.5	2.12	1.75	1.17

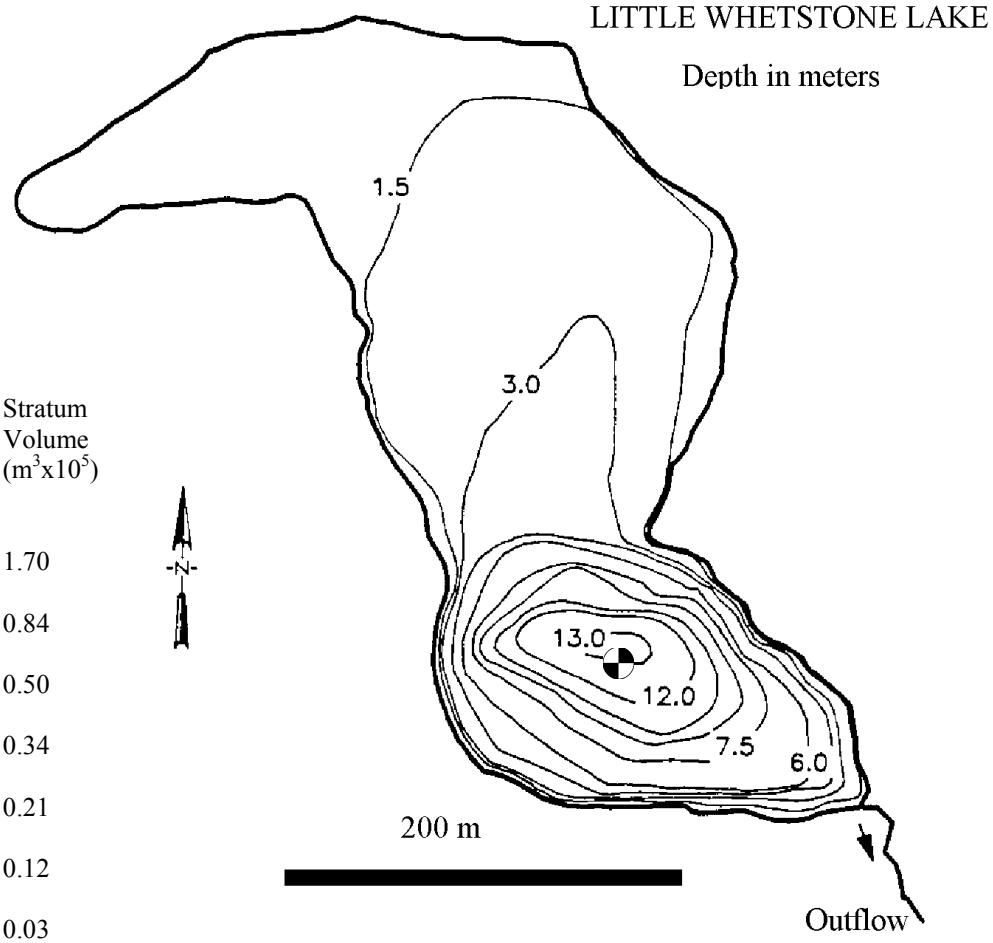
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	11.67	
		1.99
2	8.74	
		1.58
4	7.23	
		1.32
6	5.95	
		1.05
8	4.40	
		0.69
10	2.33	
		0.29
12	0.89	
		0.12
14	0.26	
		0.02
15.5	0.00	



Secchi Disc = Chemistry sampling location

Little Whetstone Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
10.6	3.73	3.51	13.6	1.8	1.54	0.77



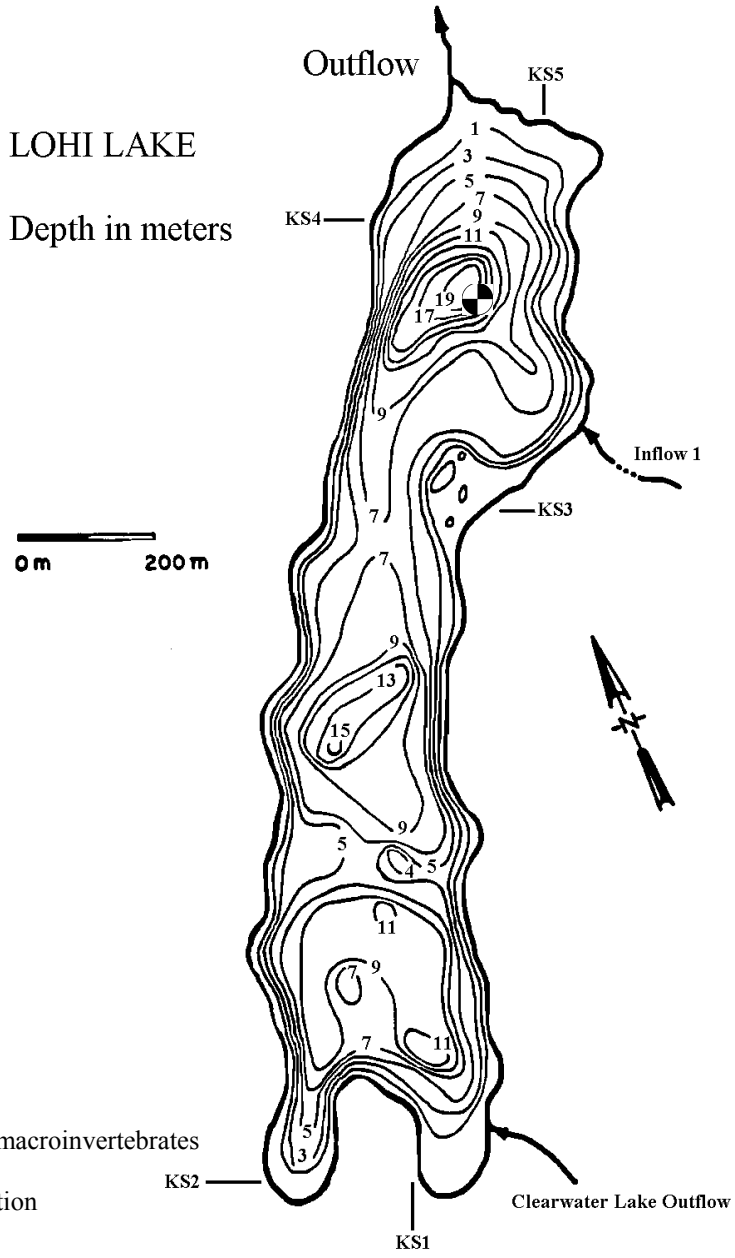
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	10.64	
		1.70
2	6.18	
		0.84
4	3.00	
		0.50
6	2.18	
		0.34
8	1.28	
		0.21
10	0.797	
		0.12
12	0.415	
		0.03
13.6	0.00	

Secchi Disc = Chemistry sampling location

Lohi Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
40.5	25.0	6.2	19.5	4.47	1.98	0.95

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	40.5	
		3.72
1	34.0	
		6.43
3	30.3	
		5.51
5	24.8	
		4.17
7	17.1	
		2.66
9	9.86	
		1.34
11	4	
		0.619
13	2.27	
		0.334
15	1.13	
		0.17
17	0.598	
		0.081
19	0.239	
		0.004
19.5	0.00	

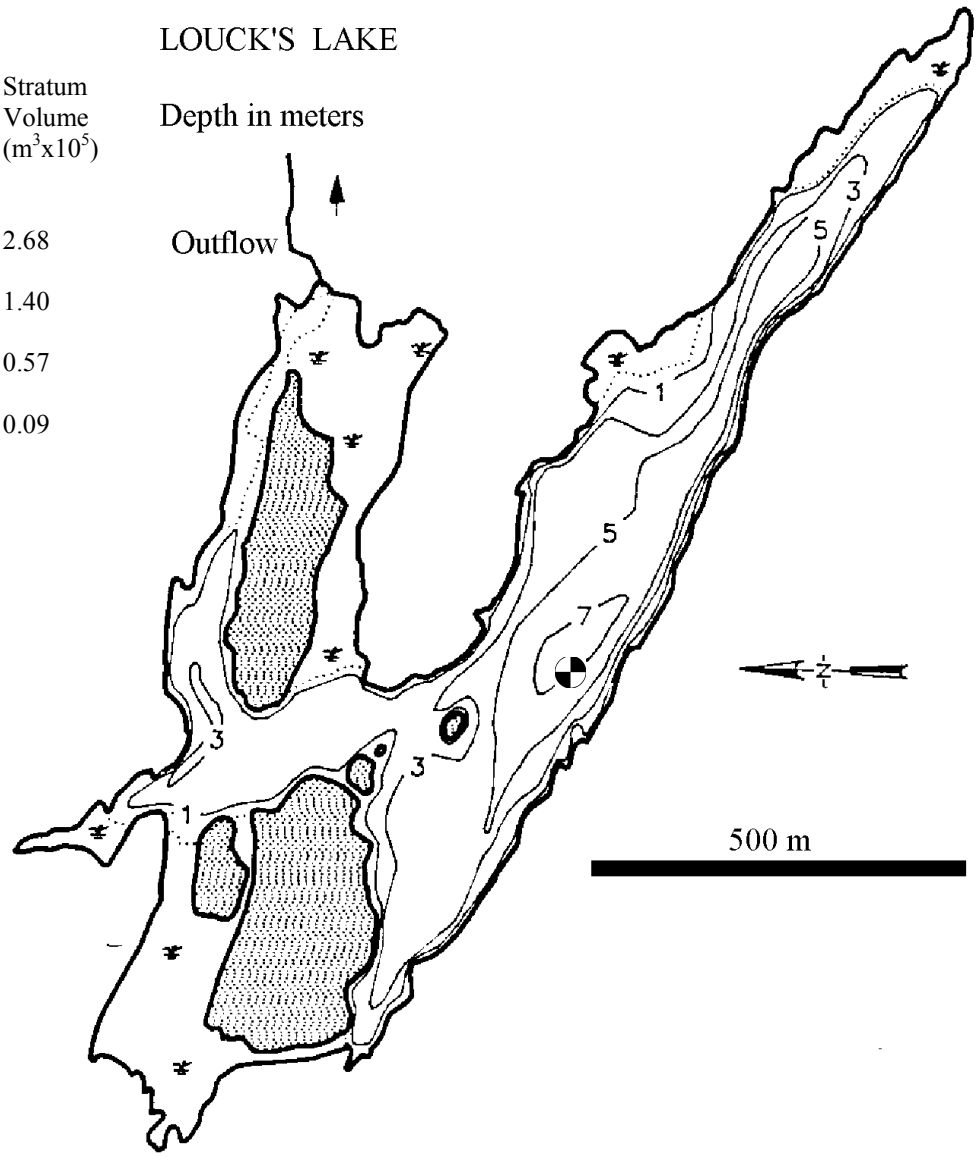


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Louck's Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
20.84	4.74	2.28	8.2	4.28	2.65	0.83

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	20.84	
		2.68
2	9.33	
		1.40
4	4.69	
		0.57
6	1.29	
		0.09
8.2	0.00	

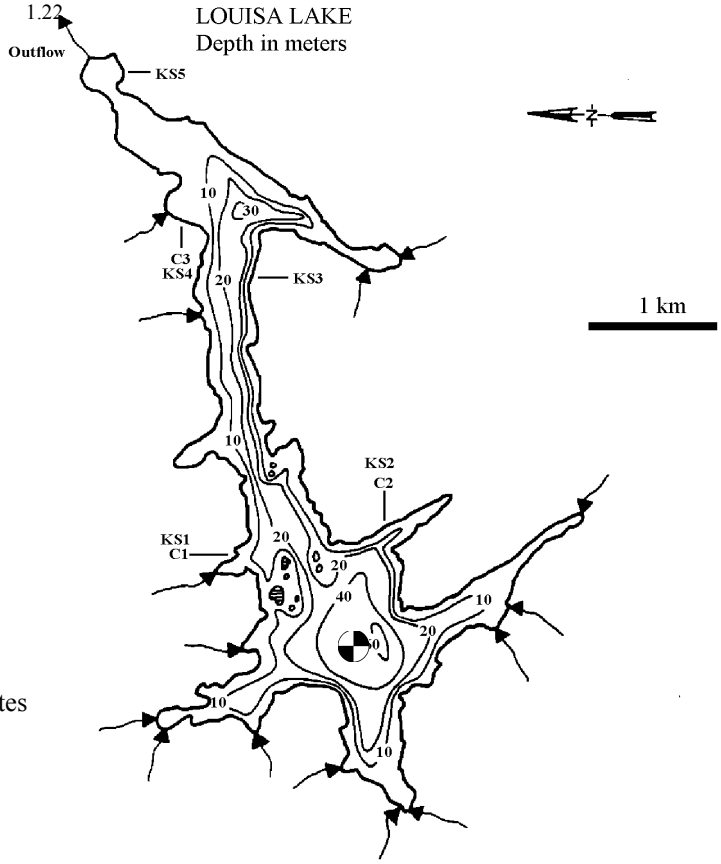


Secchi Disc = Chemistry sampling location

Louisa Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
531.0	855.9	16.1	61.0	25.9	1.97	0.79

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	531				9.39
		100.0	42	44.3	
2	469				8.34
		89.0	44	39.2	
4	422				7.39
		79.4	46	34.7	
6	372				6.55
		69.5	48	30.9	
8	324				5.80
		60.9	50	27.2	
10	285				4.91
		53.9	52	22.0	
12	254				3.94
		48.6	54	17.4	
14	232				2.99
		44.1	56	12.6	
16	210				2.04
		39.8	58	7.97	
18	188				1.22
		35.5	61	4.39	
20	167				
		31.4			
22	146				
		27.3			
24	127				
		23.6			
26	109				
		20.1			
28	92.6				
		17.0			
30	77.6				
		14.9			
32	71.5				
		13.7			
34	65.7				
		12.6			
36	60.1				
		11.5			
38	54.8				
		10.4			
40	49.7				

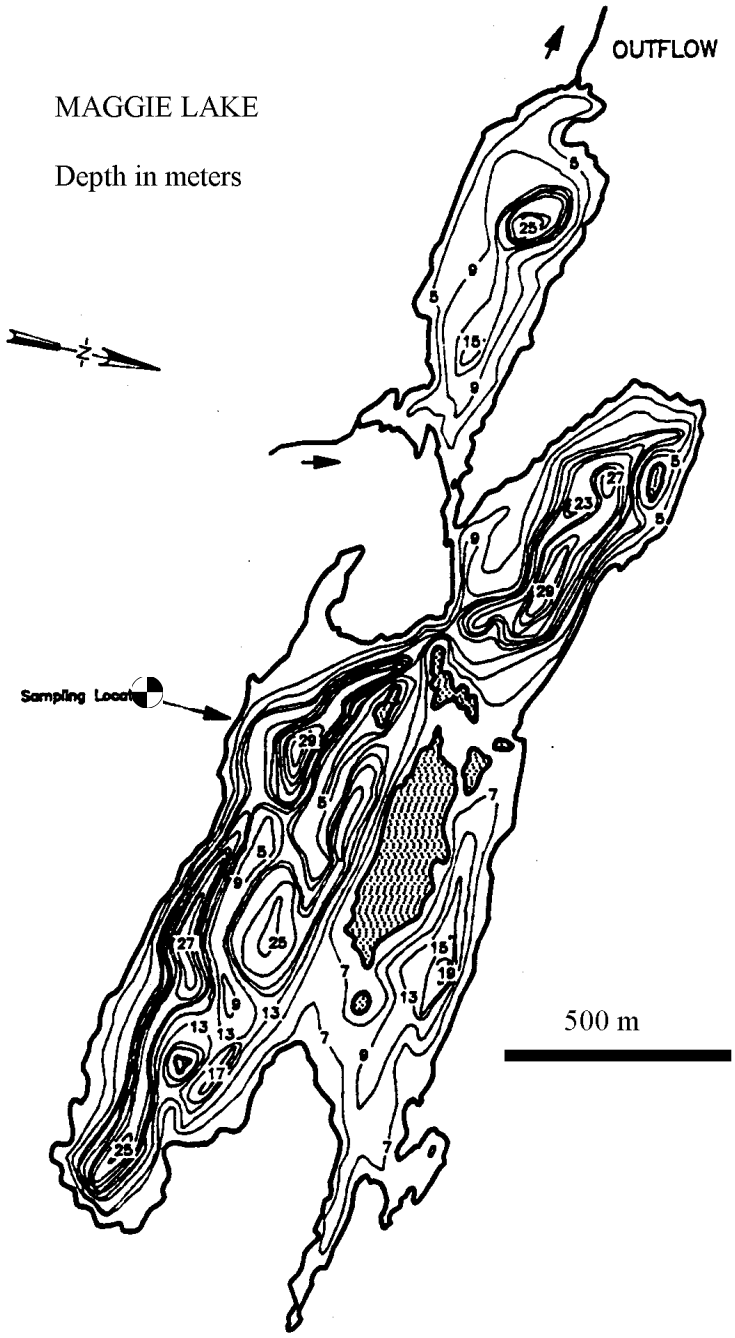


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Maggie Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
138.6	141.0	10.17	31.0	11.55	2.77	0.98

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	138.6	
		25.58
2	120.2	
		22.73
4	106.3	
		19.76
6	91.4	
		16.79
8	75.94	
		13.66
10	61.42	
		11.07
12	49.81	
		8.91
14	38.99	
		6.79
16	29.62	
		5.20
18	22.71	
		3.96
20	17.00	
		2.91
22	12.37	
		2.04
24	7.54	
		1.05
26	3.36	
		0.42
28	1.18	
		0.12
30	0.14	
		0.01
31	0.00	

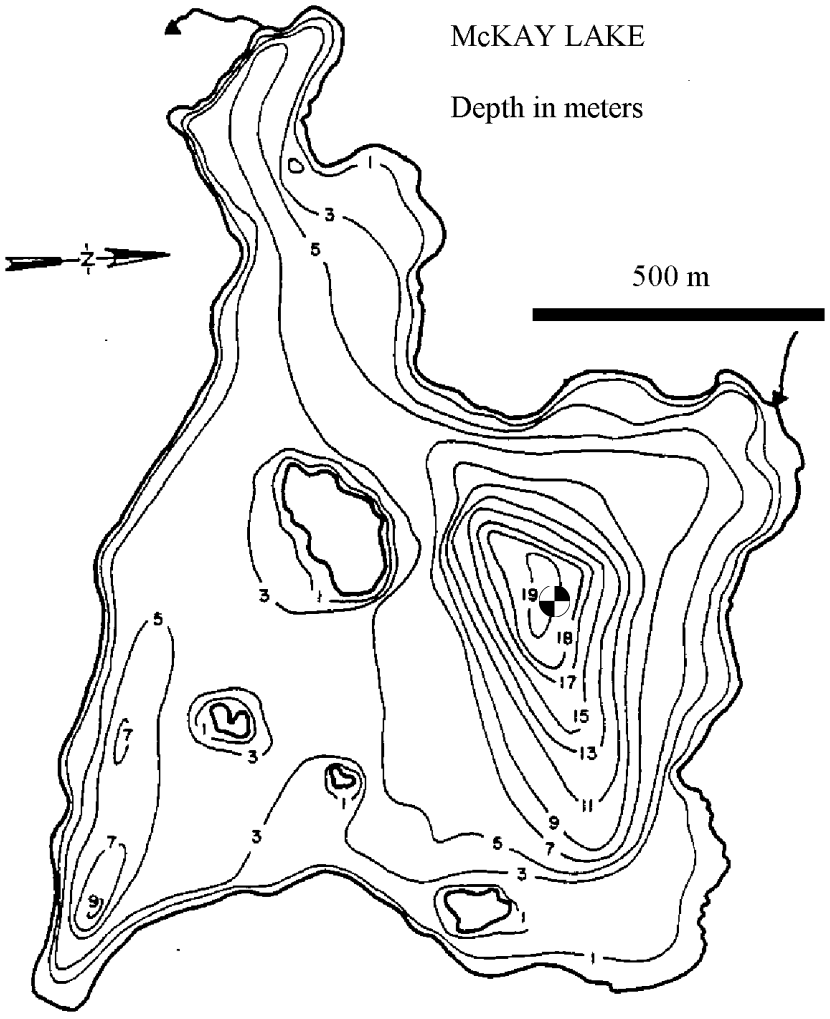


Secchi Disc = Chemistry sampling location

McKay Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
121.5	63.5	5.2	19.5	7.66	1.96	0.80

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	121.5	
		22.2
2	99.6	
		17.1
4	67.2	
		10.0
6	35.7	
		5.21
8	20.0	
		3.26
10	13.5	
		2.27
12	9.52	
		1.61
14	6.7	
		1.11
16	4.42	
		0.642
18	1.70	
		0.119
19.5	0.00	

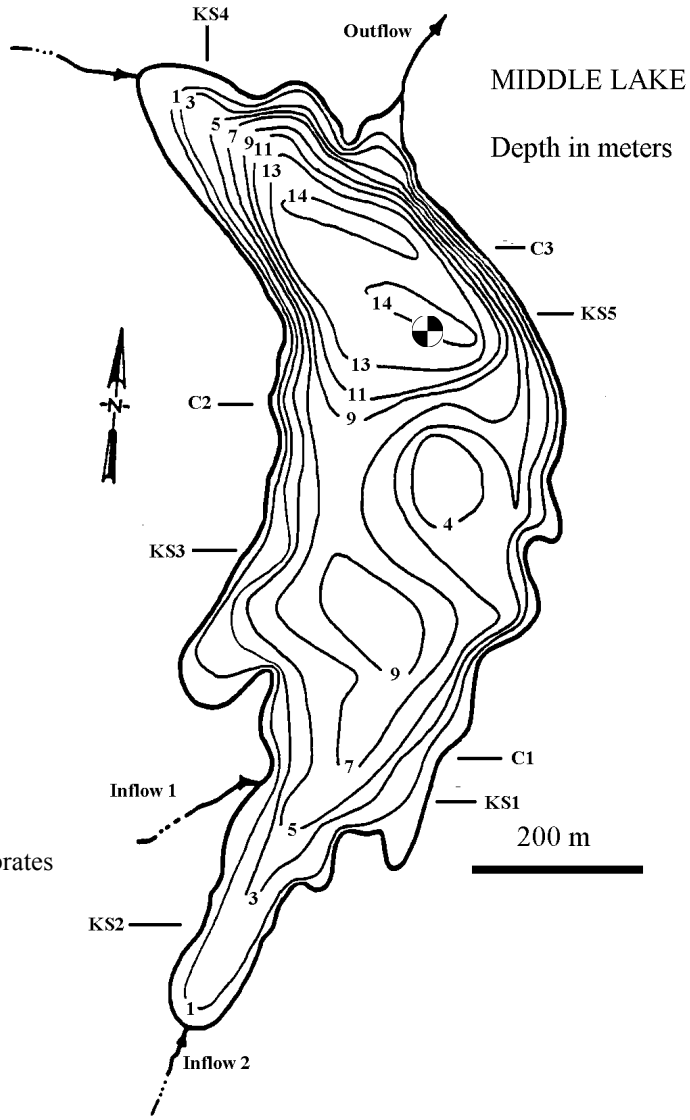


Secchi Disc = Chemistry sampling location

Middle Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
28.2	17.5	6.2	15.0	3.2	1.70	1.24

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	28.2	
		2.64
1	24.7	
		4.54
3	20.8	
		3.64
5	15.7	
		2.67
7	11.2	
		1.80
9	6.94	
		1.18
11	4.88	
		0.844
13	3.59	
		0.202
14	0.786	
		0.026
15	0.00	

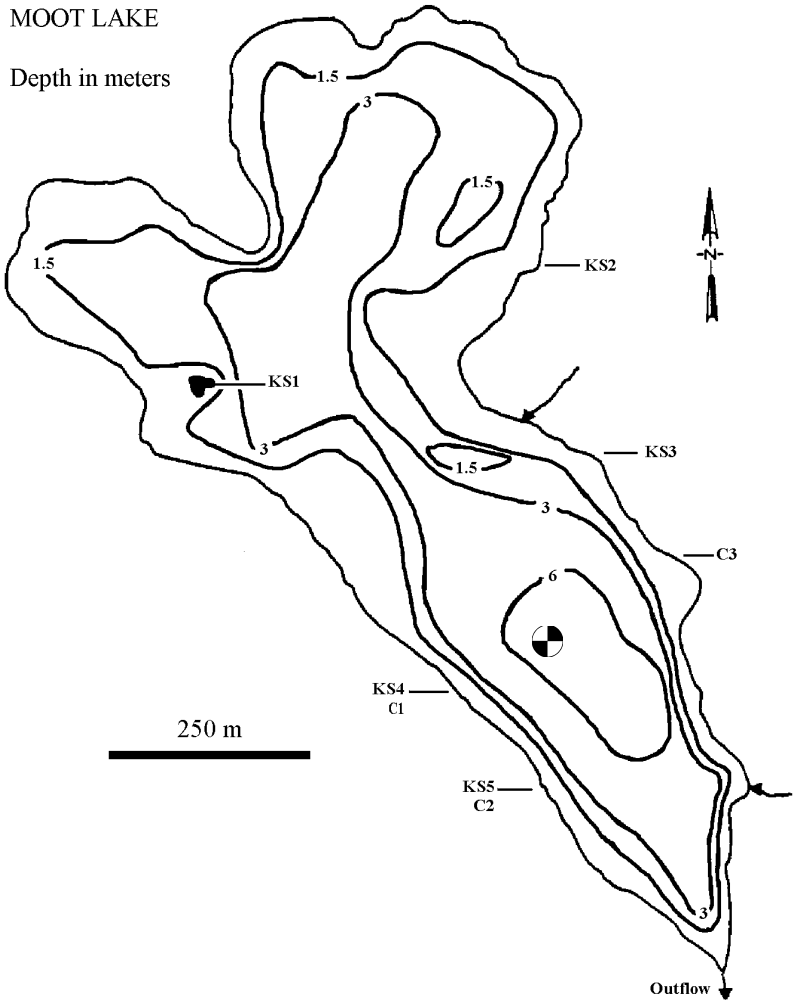


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Moot Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
46.2	12.4	2.7	7.9	4.0	1.66	1.02

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	46.2	
		7.36
2	25.5	
		3.50
4	11.1	
		1.33
6	3.05	
		0.197
7.9	0.00	

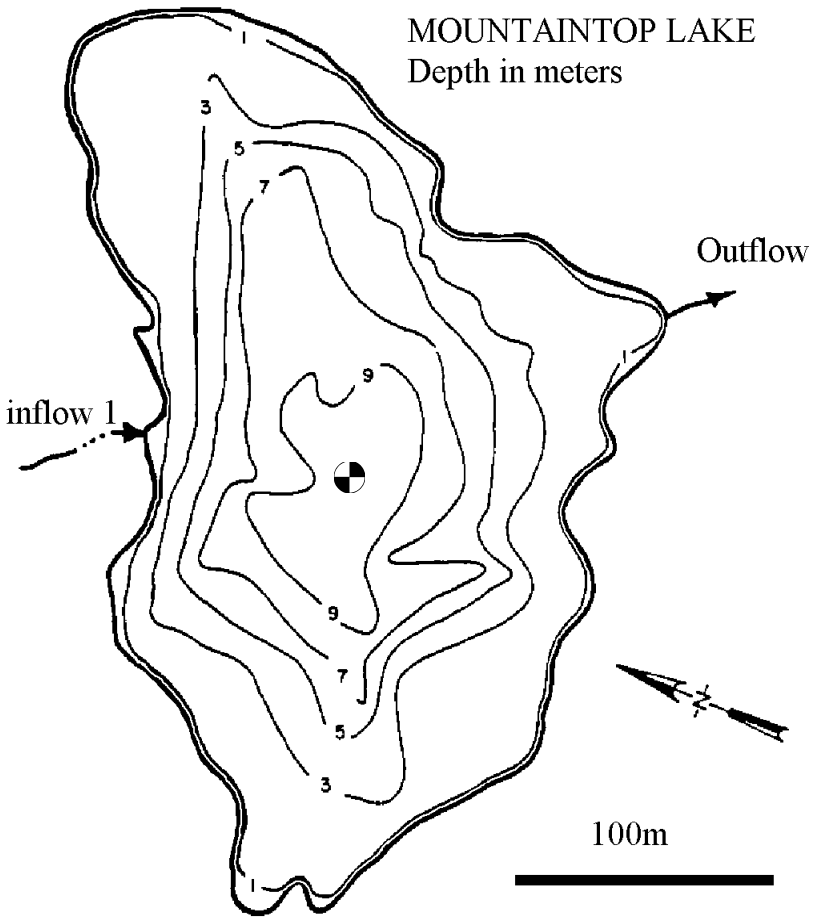


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Mountaintop Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_v
4.9	2.11	4.3	9.5	1.03	1.31	1.36

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	4.90	
		0.483
1	4.76	
		0.729
3	2.63	
		0.445
5	1.84	
		0.298
7	1.16	
		0.15
9	0.404	
		0.007
9.5	0.00	

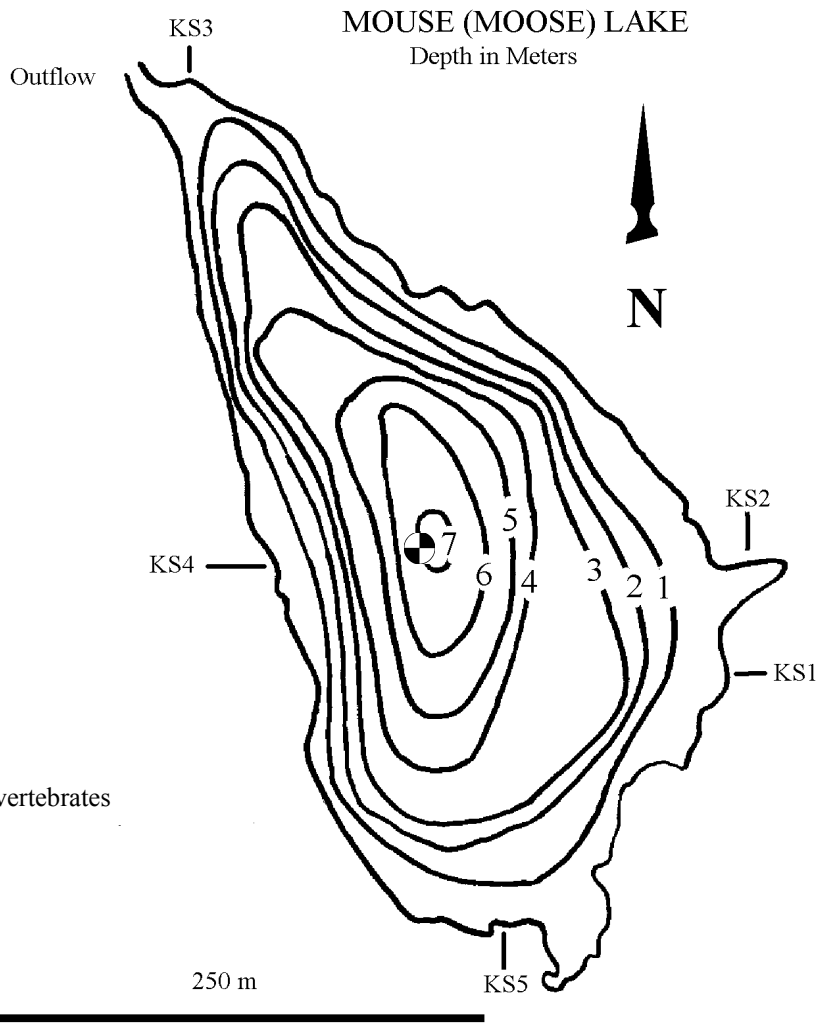


Secchi Disc = Chemistry sampling location

Mouse (Moose) Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
8.986	4.386	4.88	9.00	1.592	1.498	1.627

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	8.986	
		0.861
1	8.241	
		0.787
2	7.495	
		0.717
3	6.851	
		0.653
4	6.207	
		0.562
5	5.053	
		0.401
6	3.058	
		0.240
7	1.804	
		0.134
8	0.926	
		0.030
9	0.00	



KS= Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

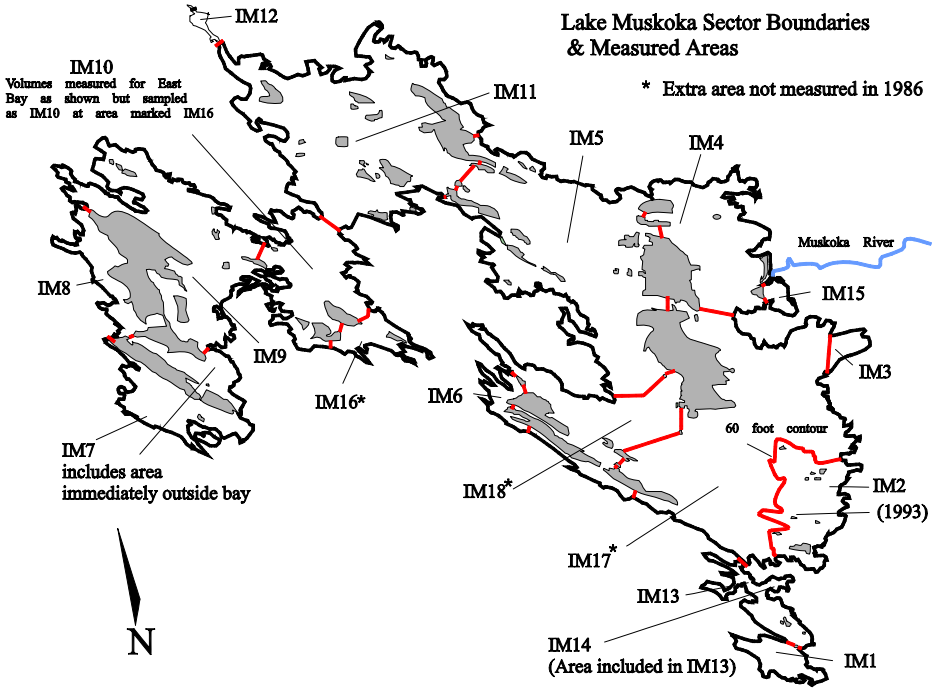
Muskoka Lake morphometry summary

Revised multi basin morphometric data also presented in Table 8

Station No.	Station Name	Corrected Areas (ha)	Mean Depth (m)	Maximum Depth (m)	Volume (m^3 x10^5)
Lake Muskoka		11,906.92	27.3	67.1	32,472.3
IM1	Gravenhurst Bay	174.02	10.1	15.2	175.0
IM2	South Bay	492.27	8.7	18.3	427.7
IM3	Stephens Bay	72.92	7.5	18.3	54.9
IM4	Birch Island (East)	758.73	6.5	15.9	490.3
IM5	Walker's Point	2,020.51	19.6	52.4	3957.0
IM6	Pine Needle Point	124.45	5.1	11.3	63.3
IM7	Bala Bay	593.06	9.8	37.2	579.1
IM8	Dudley Bay	351.33	7.9	18.3	276.4
IM9	North Bay	1,099.98	11.0	28.7	1210.0
IM10	East Bay	719.16	18.0	41.8	1295.0
IM11	Crown Island	2,033.12	25.5	67.1	5174.0
IM12	Mirror Lake	50.91	2.8	5.8	14.1
IM13	Muskoka Bay	233.96	7.3	13.5	170.9
IM14	Cliff Bay (part of Muskoka Bay)				
IM15 (extra)	Alport Lake	64.06			
IM16(extra)	Hardy Lake Park	175.00			
IM17(extra)	Rex Island	2,6170.00			
IM18(extra)	Beechgrove Island	773.44			

(extra) = areas not included in DR90/4 (1986)

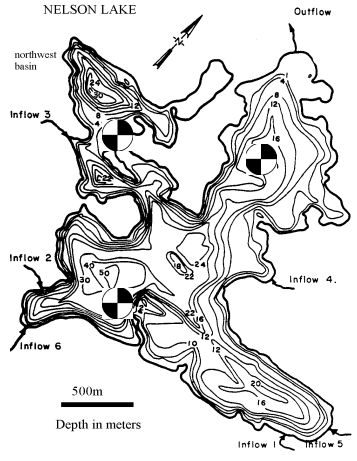
Total Surface Area	11,906.92
Muskoka River North Branch	* 60.94
Muskoka River South Branch	* 21.56
Indian River (Mirror Lake to Locks) *	26.25
*Navigable from Lake Muskoka	
Lake Area plus River Area	12,015.67



Nelson Lake morphometry summary

Basin	Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
Whole	309	359	11.6	51	33.3	5.35	0.68
Main	274	331	12	51			0.71
N. W.	34.6	28	8	31			0.78

Whole Lake			Main Basin			N. W. Basin		
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	309		0	274		0	34.6	
		56			50.4			5.65
2	253		2	230		2	22.3	
		47.3			43.2			4.08
4	221		4	202		4	18.5	
		41.8			38.4			3.41
6	197		6	181		6	15.6	
		36.7			33.9			2.78
8	171		8	158		8	12.2	
		31.8			29.6			2.27
10	148		10	138		10	10.4	
		27.1			25.2			1.93
12	123		12	114		12	8.87	
		22.6			20.9			1.67
14	103		14	95.3		14	7.82	
		18.6			17.2			1.48
16	83.7		16	76.7		16	6.98	
		14.9			13.6			1.3
18	66.0		18	59.9		18	6.05	
		11.8			10.7			1.08
20	52.2		20	47.4		20	4.81	
		9.63			8.76			0.87
22	44.2		22	40.3		22	3.92	
		7.66			7.01			0.66
24	32.7		24	30.0		24	2.7	
		5.88			5.43			0.44
26	26.2		26	24.4		26	1.76	
		4.9			4.63			0.27
28	22.8		28	21.9		28	0.93	
		4.23			4.13			0.09
30	19.5		30	19.4		30	0.08	
		3.7			3.69			0.003
32	17.5		32	17.5		31	0.00	
		3.12			3.12			
34	13.8		34	13.8				
		2.50			2.50			
36	11.3		36	11.3				
		2.12			2.12			
38	9.92		38	9.92				
		1.82			1.82			
40	8.29		40	8.29				
		1.54			1.54			
42	7.08		42	7.08				
		1.3			1.3			
44	5.92		44	5.92				
		1.01			1.01			
46	4.2		46	4.22				
		0.67			0.67			
48	2.58		48	2.58				
		0.38			0.38			
50	1.29		50	1.29				
		0.04			0.04			
51	0.00		51	0.00				

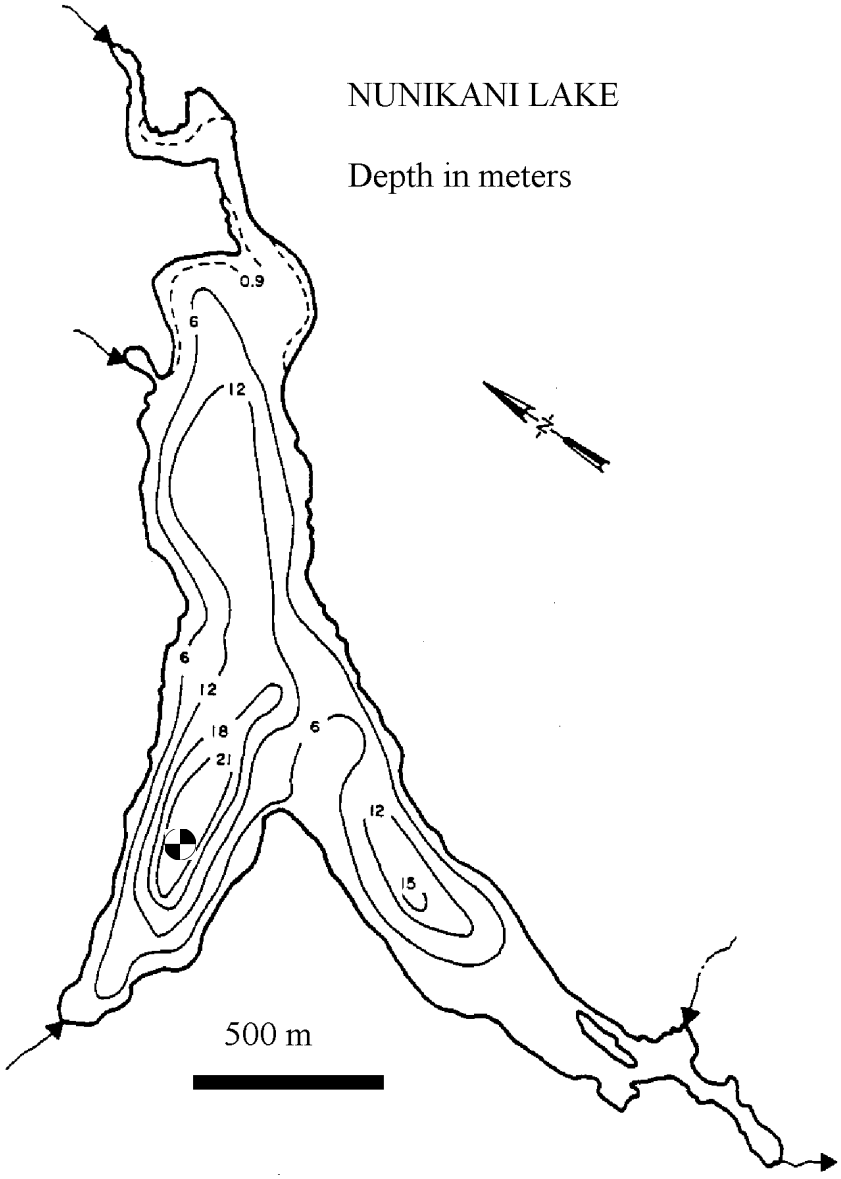


Secchi Disc = Chemistry sampling location

Nunikani Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
116.0	91.7	7.9	24.0	9.76	2.56	0.99

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	116.0	
		20.6
2	90.9	
		16.3
4	72.0	
		12.7
6	55.3	
		10.5
8	49.8	
		9.23
10	42.5	
		7.46
12	32.3	
		5.64
14	24.3	
		4.02
16	16.2	
		2.37
18	7.98	
		1.28
20	4.93	
		0.68
22	2.07	
		0.138
24	0.00	

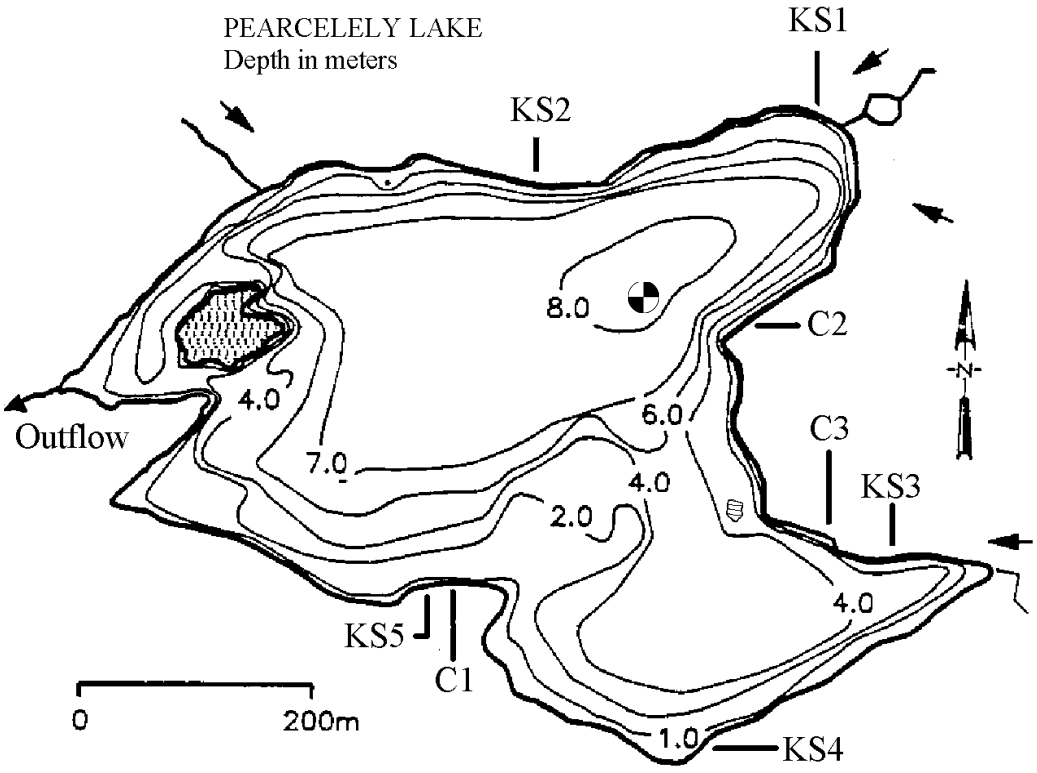


Secchi Disc = Chemistry sampling location

Pearceley Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
44.14	20.82	4.72	8.1	3.1	1.32	1.75

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	44.14	
		8.03
2	34.68	
		6.15
4	26.95	
		4.44
6	17.73	
		2.21
8.1	0.00	

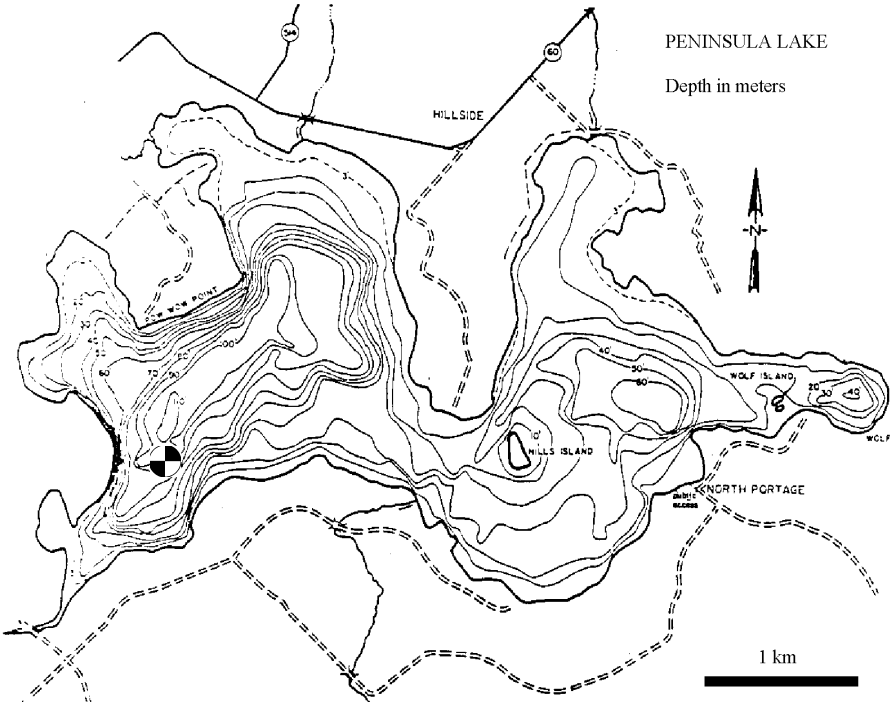


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Peninsula Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{\times}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
822.9	818.3	9.94	34.14	25.86	2.54	0.87

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	822.9	
		149.3
2	672.3	
		121.7
4	557.9	
		103.2
6	475.3	
		86.20
8	387.6	
		69.47
10	309.1	
		54.80
12	240.3	
		44.79
14	211.1	
		39.71
16	185.1	
		34.26
18	157.9	
		28.94
20	131.7	
		23.99
22	110	
		20.40
24	94.18	
		16.44
26	68.63	
		11.34
28	46.93	
		7.978
30	33.24	
		4.696
32	12.68	
		1.121
34	0.00	

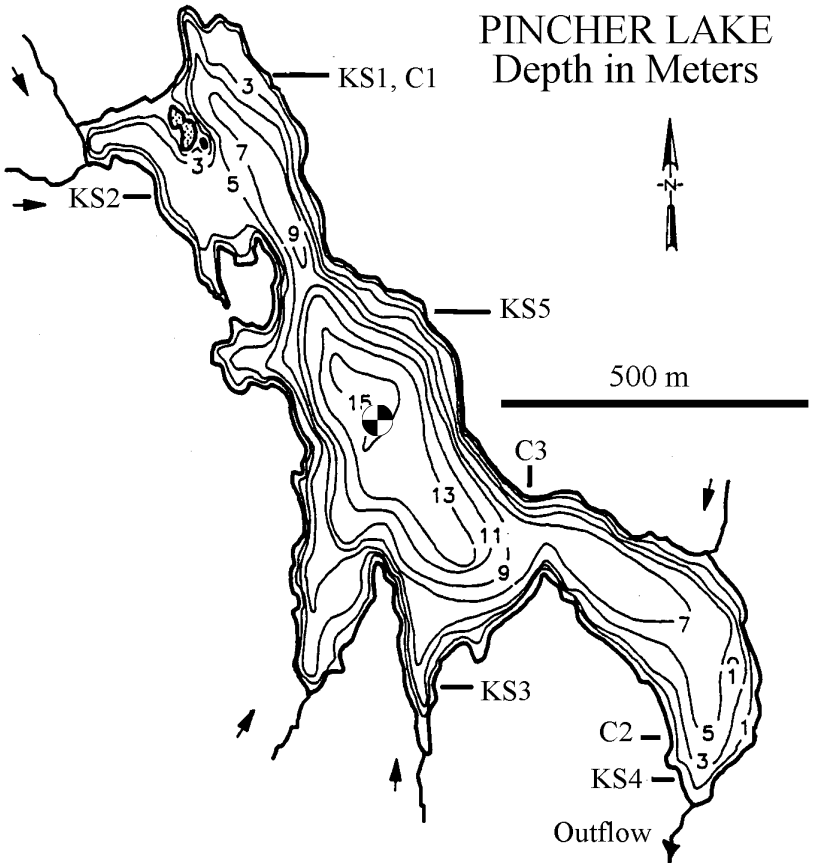


Secchi Disc = Chemistry sampling location

Pincher Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
42.06	25.48	6.06	15.5	5.52	2.40	1.17

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	42.06	
		7.44
2	33.39	
		6.01
4	26.38	
		4.54
6	19.87	
		3.11
8	12.47	
		2.01
10	8.31	
		1.39
12	5.57	
		0.82
14	2.22	
		0.16
15.5	0.00	

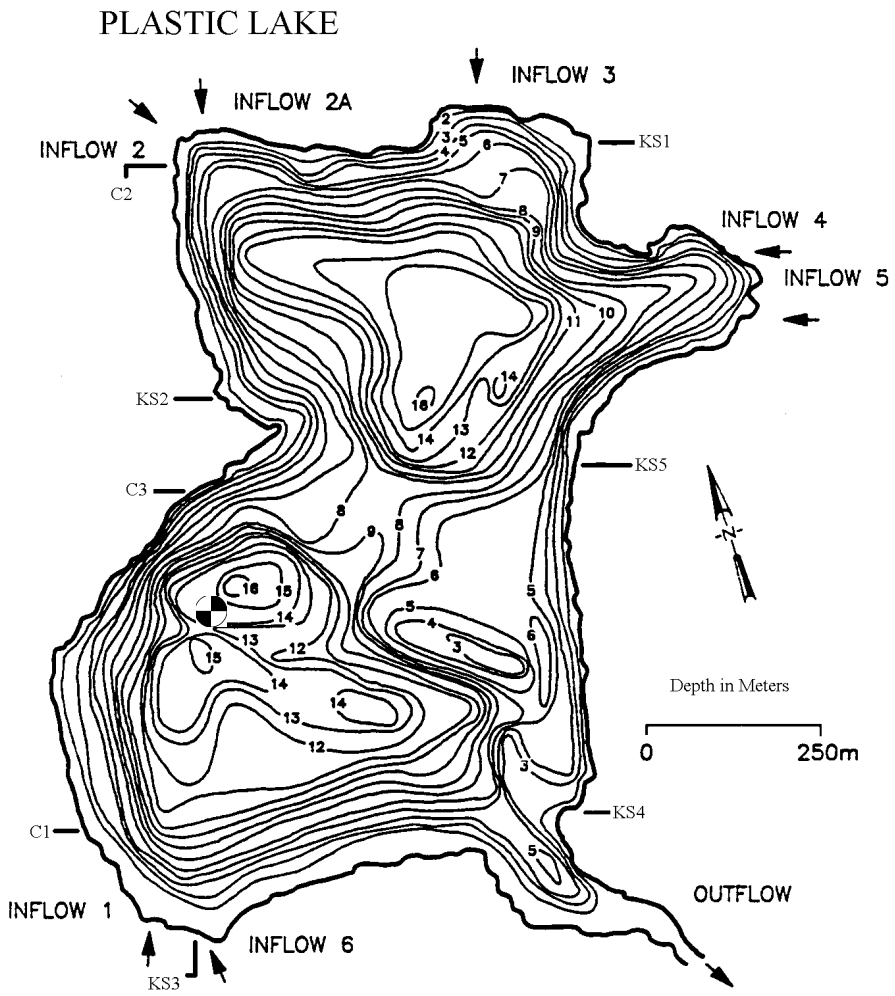


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Plastic Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
32.14	25.24	7.9	16.3	3.14	1.56	1.50

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	32.14	
		6.11
2	28.97	
		5.37
4	24.84	
		4.47
6	19.65	
		3.46
8	14.95	
		2.60
10	11.23	
		1.88
12	7.29	
		1.06
14	3.35	
		0.297
16.3	0.00	



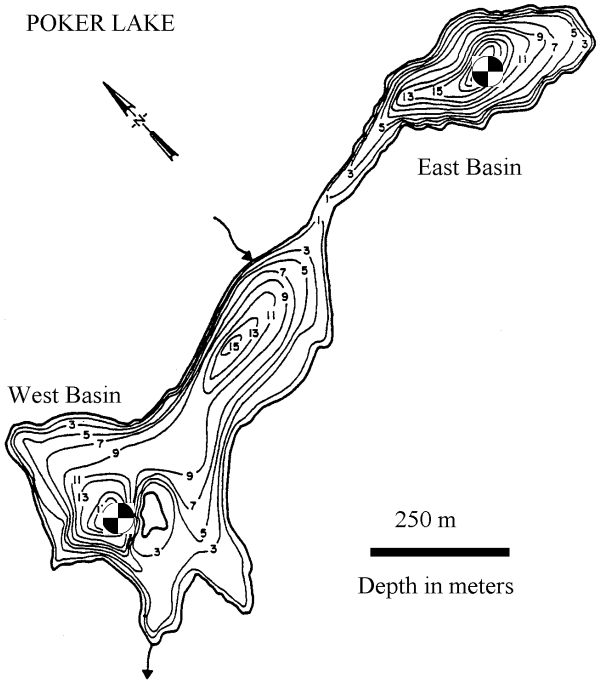
KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Poker Lake morphometry summary

Basin	Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
Whole	20.8	13.3	6.4	20.5	3.83	2.37	0.94
East (PRE)	5.42	3.72	6.9	20.5	1.38	1.67	1.00
Main(PR)	15.3	9.61	6.3	17.5	2.45	1.77	1.07

Whole Lake			Main Basin (PR)			East Basin (PRE)		
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	20.8		0	15.3		0	5.42	
		3.80			2.82			0.984
2	17.1		2	12.6		2	4.49	
		3.04			2.23			0.813
4	13.3		4	9.72		4	3.56	
		2.31			1.70			0.613
6	10		6	7.42		6	2.62	
		1.73			1.29			0.447
8	7.21		8	5.33		8	1.88	
		1.16			0.842			0.314
10	4.26		10	2.96		10	1.29	
		0.619			0.404			0.214
12	2.33		12	1.44		12	0.888	
		0.361			0.213			0.148
14	1.32		14	0.712		14	0.603	
		0.191			0.094			0.097
16	0.686		16	0.305		16	0.380	
		0.098			0.028			0.059
18	0.298		17.5	0.00		18	0.217	
		0.031						0.027
20	0.043					20	0.043	
		0.001						0.001
20.5	0.00					20.5	0.00	

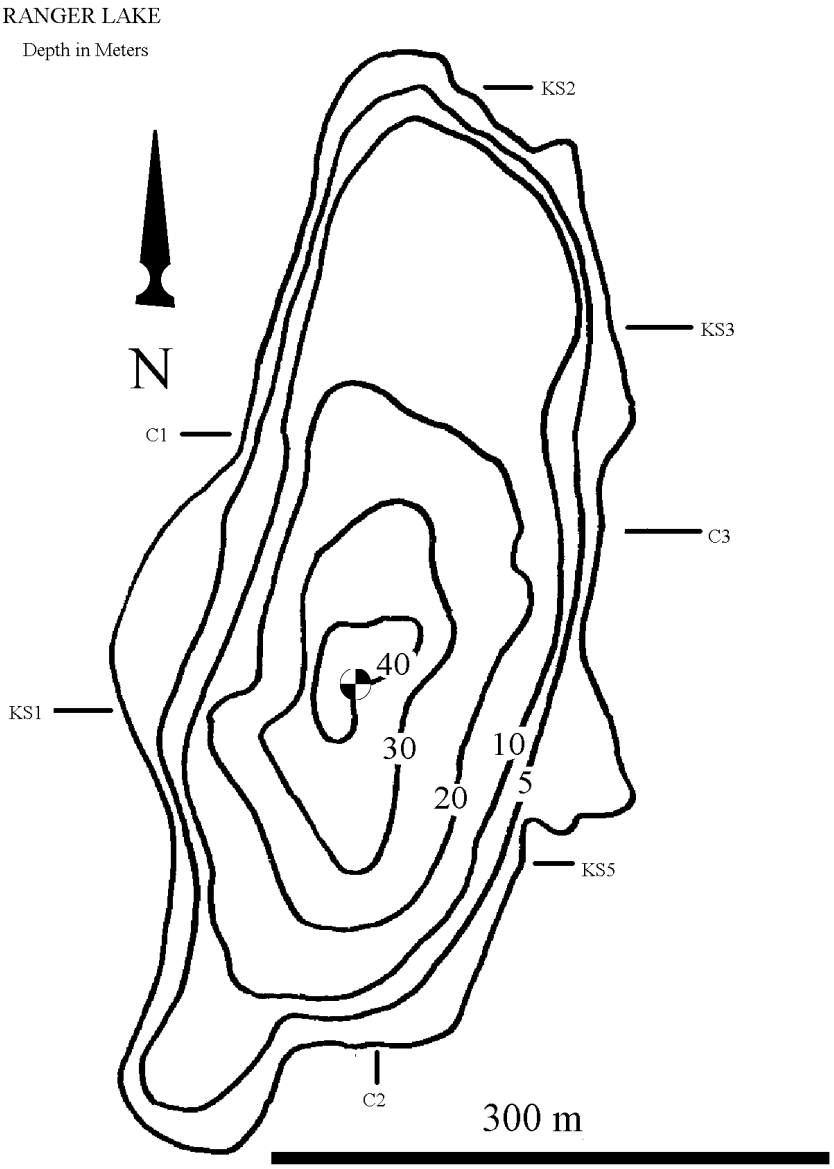
Secchi Disc = Chemistry sampling location



Ranger Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
11.252	6.325	5.621	13.00	1.63	1.371	1.297

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	11.252	
		1.085
1	10.458	
		1.006
2	9.664	
		0.926
3	8.852	
		0.844
4	8.04	
		0.747
5	6.931	
		0.573
6	4.605	
		0.373
7	2.912	
		0.258
8	2.270	
		0.188
9	1.517	
		0.136
10	1.202	
		0.103
11	0.861	
		0.068
12	0.519	
		0.017
13	0.00	



KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Red Chalk Lake morphometry summary

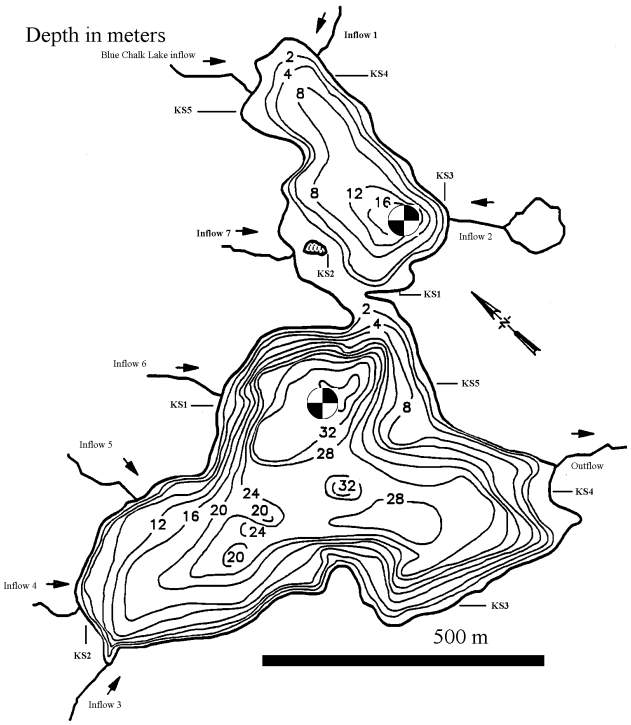
Basin	Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
Whole	57.13	81.1	14.2	38.0	4.97	1.85	1.12
Main (RCM)	44.08	73.52	16.7	38.0	3.24	1.37	1.32
East (RCE)	13.05	7.48	5.7	19.0	1.72	1.34	0.90

Whole Lake Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	57.13	
		10.59
2	48.85	
		9.37
4	44.87	
		8.56
6	40.75	
		7.75
8	36.83	
		6.96
10	32.85	
		6.19
12	29.1	
		5.56
14	26.51	
		5.05
16	24.05	
		4.52
18	21.17	
		3.96
20	18.49	
		3.46
22	16.10	
		2.99
24	13.87	
		2.31
26	9.38	
		1.5
28	5.77	
		1.00
30	4.28	
		0.73
32	3.02	
		0.42
34	1.32	
		0.15
36	0.32	
		0.02
38	0.00	

Main Basin (RCM) Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	44.08	
		8.4
2	39.97	
		7.76
4	37.6	
		7.27
6	35.11	
		6.78
8	32.7	
		6.29
10	30.21	
		5.8
12	27.81	
		5.34
14	25.63	
		4.92
16	23.54	
		4.45
18	20.94	
		3.94
20	18.49	
		3.46
22	16.10	
		2.99
24	13.87	
		2.31
26	9.38	
		1.50
28	5.77	
		1.00
30	4.28	
		0.73
32	3.02	
		0.42
34	1.32	
		0.15
36	0.32	
		0.02
38	0.00	

East Basin (RCE) Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	13.05	
		2.18
2	8.88	
		1.61
4	7.27	
		1.28
6	5.59	
		0.97
8	4.12	
		0.66
10	2.5	
		0.37
12	1.3	
		0.2
14	0.76	
		0.13
16	0.51	
		0.07
18	0.25	
		0.01
19	0.00	

RED CHALK LAKE

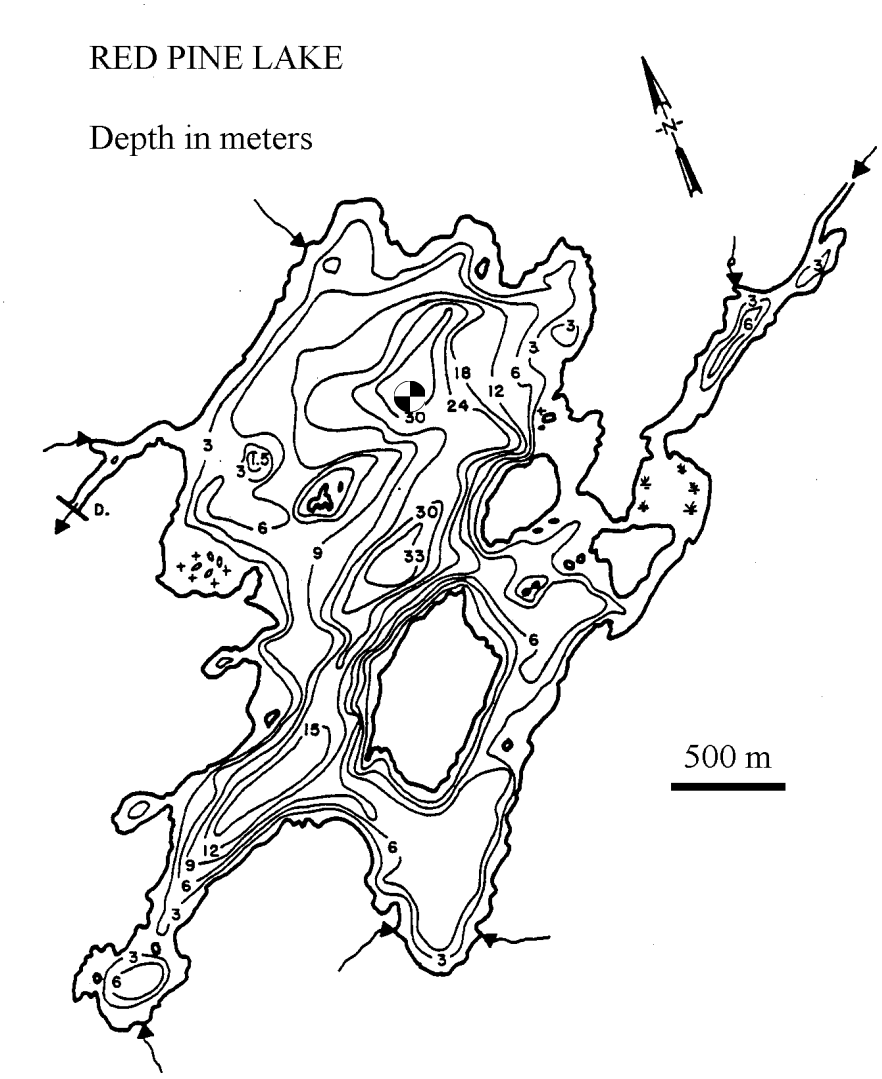


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Red Pine Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
365.0	367.0	10.1	38.7	19.7	2.91	0.78

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	365	
		66.0
2	297	
		53.9
4	243	
		44.4
6	201	
		36.9
8	168	
		30.6
10	138	
		24.9
12	111	
		20.7
14	96.3	
		18.0
16	83.5	
		15.5
18	71.5	
		13.3
20	61.1	
		11.3
22	51.7	
		9.46
24	43.0	
		7.55
26	32.7	
		5.56
28	23.2	
		3.83
30	15.3	
		2.57
32	10.5	
		1.74
34	6.97	
		1.10
36	4.15	
		0.386
38	0.384	
		0.009
38.7	0.00	

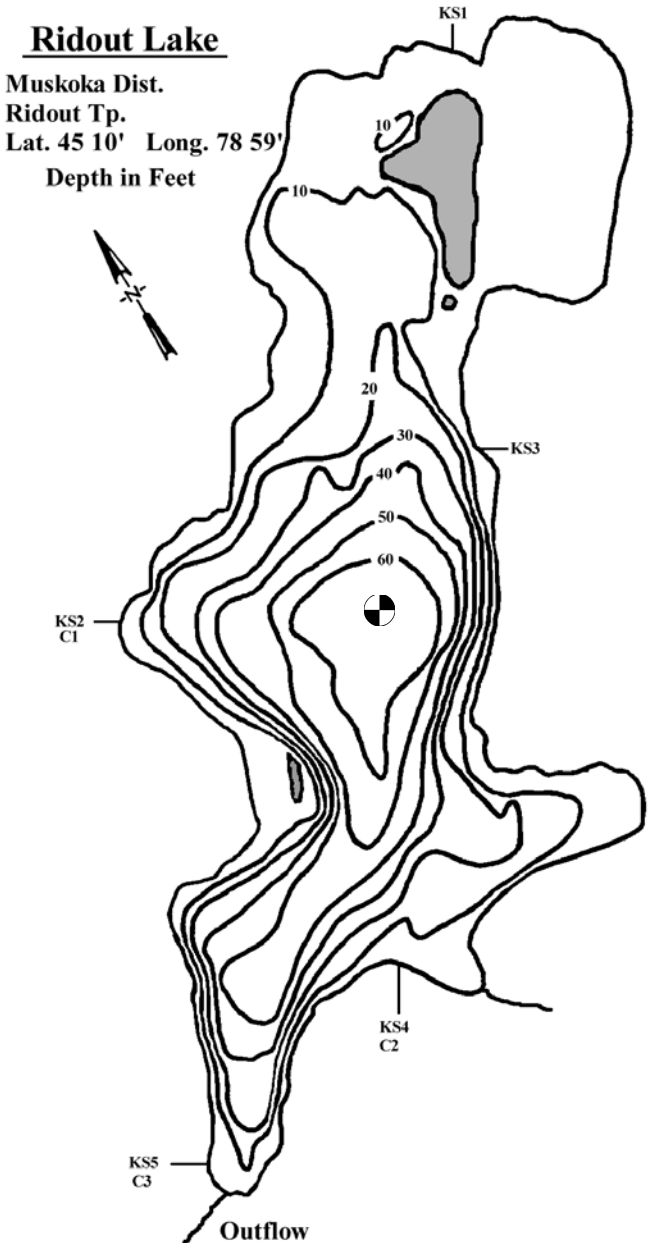


Secchi Disc = Chemistry sampling location

Ridout Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3 x 10^5)	Mean Depth $z\bar{x}$ (m)	Maximun Depth Zm (m)	Shoreline Length L (Km)	Development of Shoreline D_L	Development of Volume D_V
46.8	30.98	6.6	20.4	6.3	2.6	0.97

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3 x 10^5)
0	46.8	
		4.36
2	34.2	
		3.1
4	25.4	
		2.41
6	20.4	
		1.75
8	16.4	
		1.7
10	12.9	
		1.21
12	9.8	
		0.72
14	6.7	
		0.7
16	4.1	
		0.37
18	2.0	
		0.12
20.4	0.0	



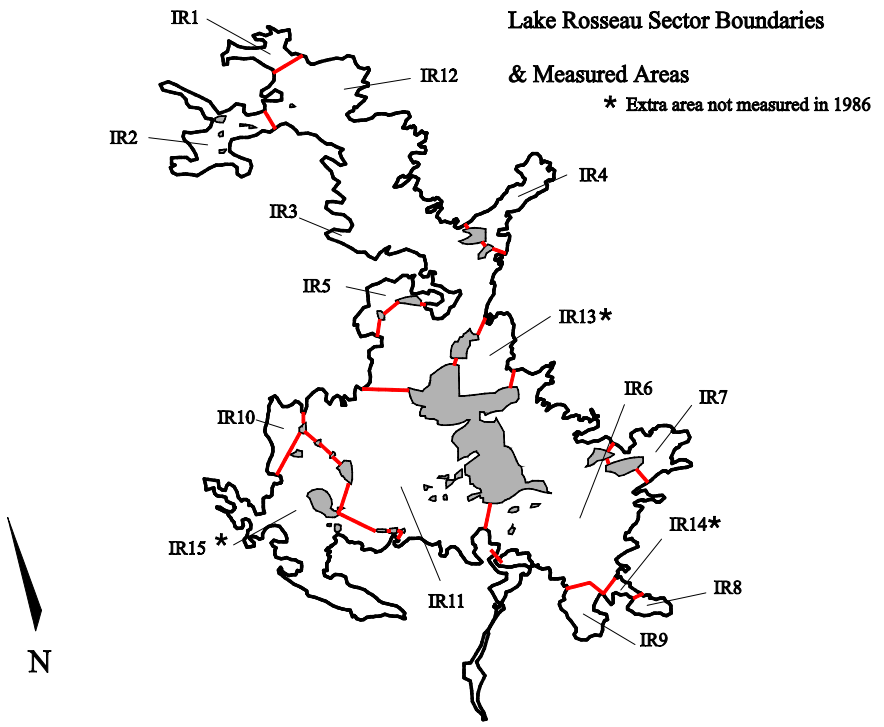
Secchi Disc = Chemistry sampling location

Lake Rosseau morphometry summary

Revised multi basin morphometric data also presented in Table 8

Station No.	Station Name	Corrected Areas (ha)	Mean Depth (m)	Maximum Depth (m)	Volume (m^3 x10^5)
Lake Rosseau		6,294.97	23.4	90.2	14,726.7
IR1	Cameron Bay	92.85	7.1	13.4	66.0
IR2	Morgan Bay	257.24	11.7	29.6	300.1
IR3	Wiley's Bay	36.44	9.9	18.3	35.9
IR4	Skeleton Bay	172.47	9.9	20.1	170.5
IR5	Rest Harbour	136.67	11.3	22.3	155.1
IR6	Tobin Island	1,242.57	16.6	35.1	2064.0
IR7	Portage Bay	145.21	6.7	12.8	98.0
IR8	Brackenrig Bay	42.44	1.9	4.3	8.2
IR9	Arthurlie Bay	107.86	5.0	7.3	53.5
IR10	Minette Ouno Is.)	122.61	6.7	15.5	81.7
IR11	Venetia Group	1,188.25	23.5	46.6	2792.0
IR12	Mutchinbaker Bay	1,754.73	38.4	90.2	6731.0

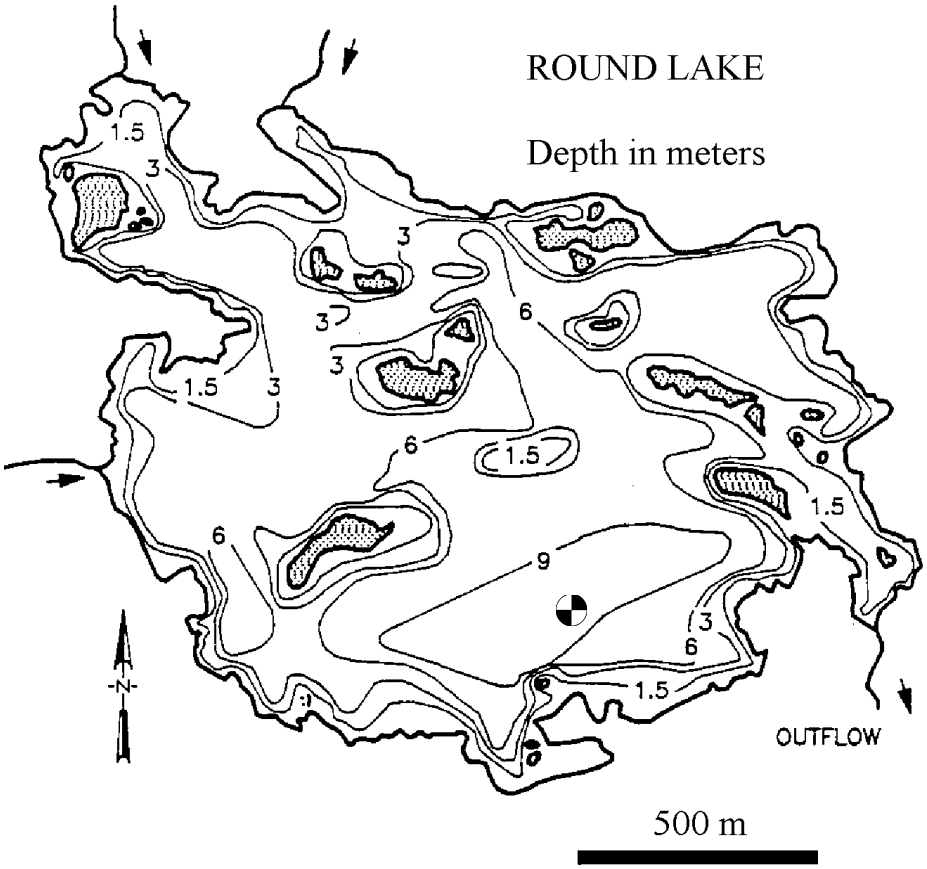
IR13(extra)	Rostrevor	229.69
IR 14(extra)	Pickerel Point	28.44
IR14 (extra)	Black Rock Point	737.50
(extra)=areas not included in DR90/4 (1986)		
Indian River (Greenridge Point to Locks)		52.50
Lake Area plus River Area		6,347.47



Round Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
226.0	99.08	4.38	11.6	11.87	2.23	1.13

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	226	39.01
2	166.8	28.31
4	114.6	17.99
6	67.32	9.66
8	31.46	3.73
10	7.15	0.38
11.6	0.00	

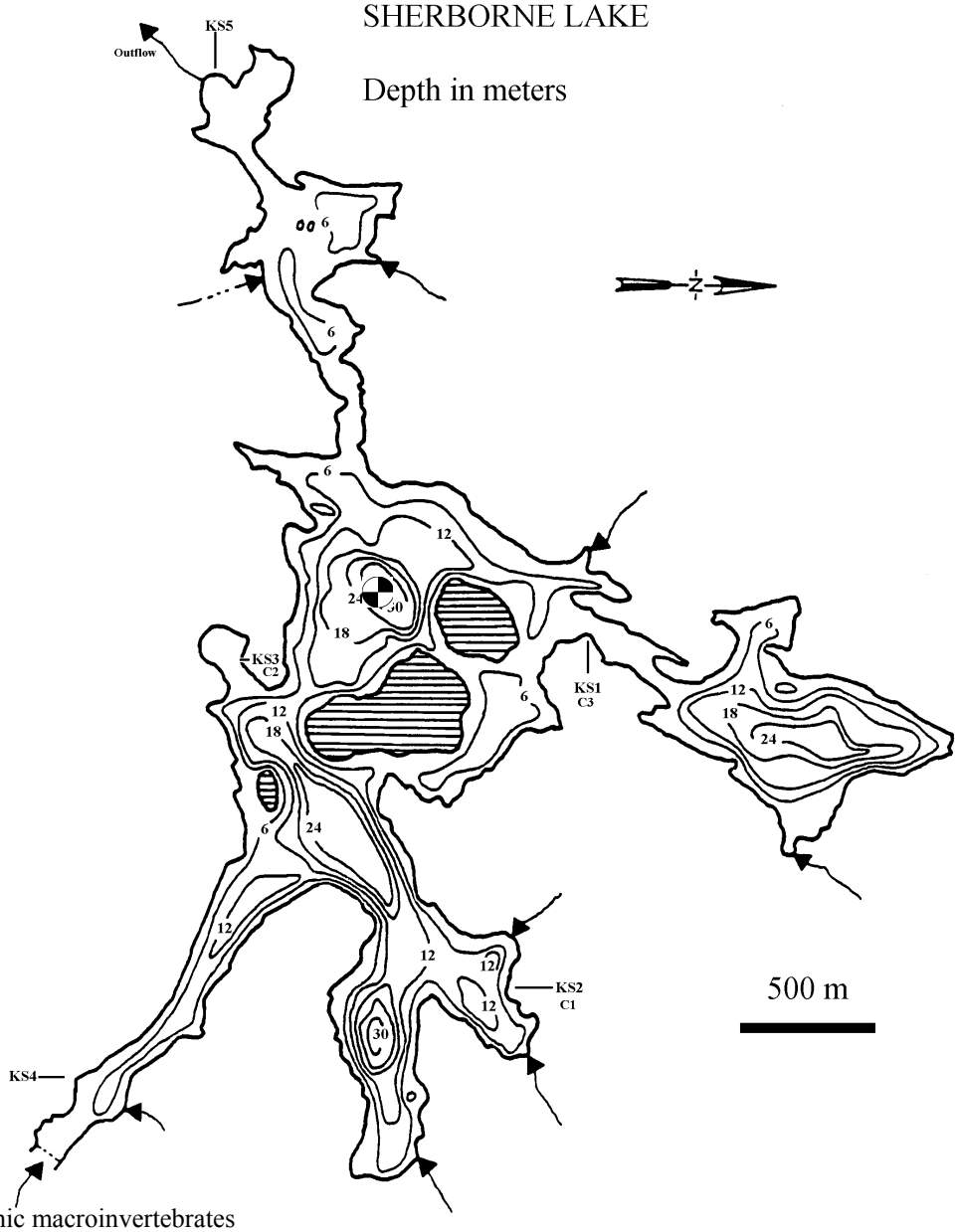


Secchi Disc = Chemistry sampling location

Sherborne Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_V
252.0	240.9	9.6	35.1	19.7	3.50	0.82

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	252	
		45.8
2	207	
		37.7
4	171	
		31.0
6	140	
		25.9
8	119	
		21.8
10	99.2	
		18.0
12	81.5	
		14.7
14	65.7	
		11.7
16	51.6	
		9.05
18	39.2	
		7.05
20	31.5	
		5.64
22	25.0	
		4.43
24	19.4	
		3.24
26	13.3	
		2.11
28	8.07	
		1.20
30	4.18	
		0.549
32	1.53	
		0.149
34	0.182	
		0.006
35.1	0.00	

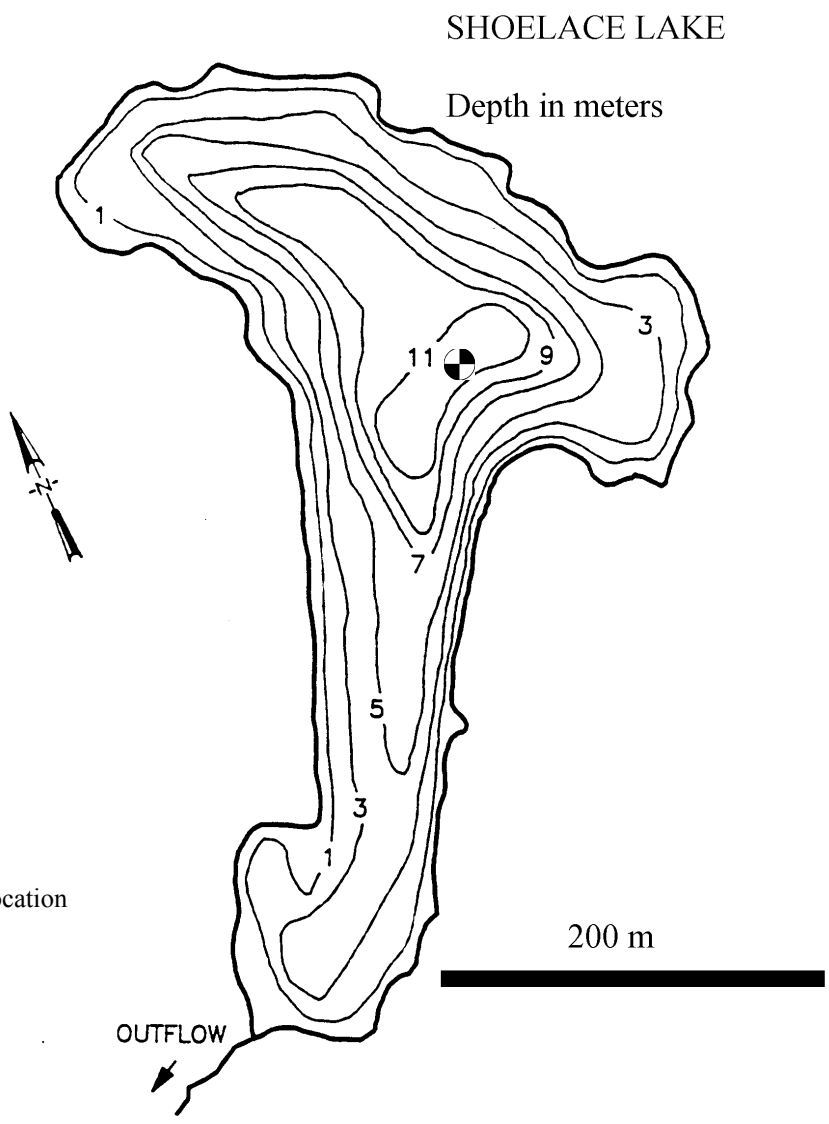


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Shoelace Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
7.23	3.23	4.46	12.0	1.67	1.75	1.12

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	7.23	
		1.22
2	5.16	
		0.86
4	3.43	
		0.54
6	2.10	
		0.33
8	1.36	
		0.21
10	0.66	
		0.059
12	0.00	

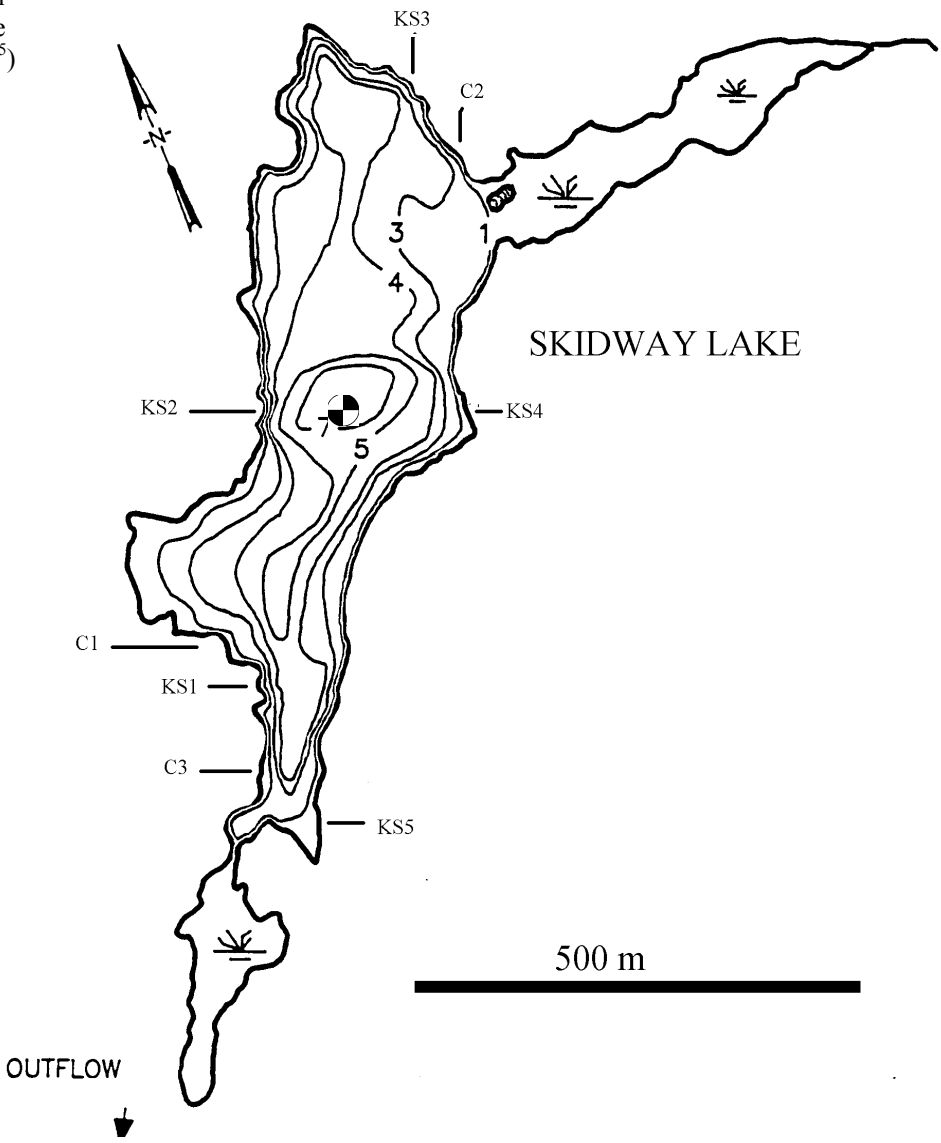


Secchi Disc = Chemistry sampling location

Skidway Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
18.48	5.35	2.89	7.8	2.84	1.86	1.11

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	18.48	
		2.86
2	11.75	
		1.89
4	6.09	
		0.50
6	1.06	
		0.10
7.8	0.00	

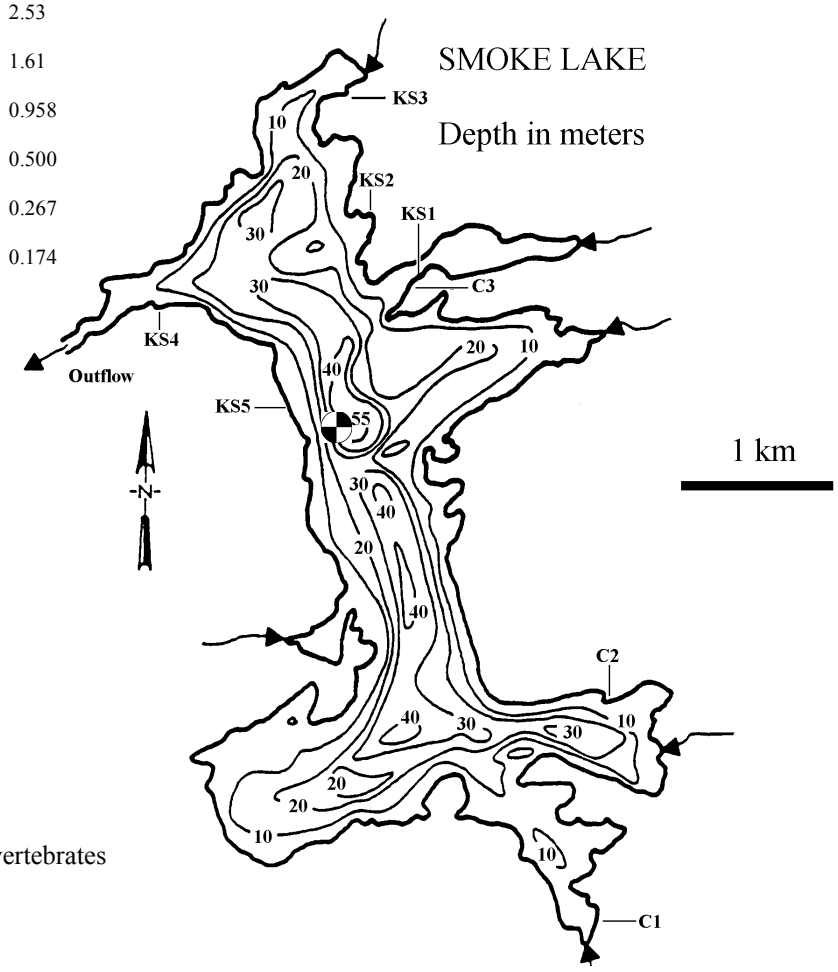


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Smoke Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
679.0	1099	16.2	55.0	29.3	3.17	0.88

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	679		32	85.5	
		128			14.9
2	598		34	64.4	
		115			11.1
4	551		36	47.1	
		106			8.0
6	513		38	33.3	
		98.2			5.48
8	470		40	21.9	
		88.3			3.71
10	414		42	15.4	
		78.3			2.53
12	370		44	10.1	
		70.9			1.61
14	340		46	6.19	
		65.1			0.958
16	311		48	3.52	
		58.7			0.500
18	276		50	1.60	
		51.8			0.267
20	243		52	1.09	
		45.3			0.174
22	211		55	0.670	
		39.1			
24	180				
		33.4			
26	154				
		28.5			
28	131				
		24.0			
30	110				
		19.5			

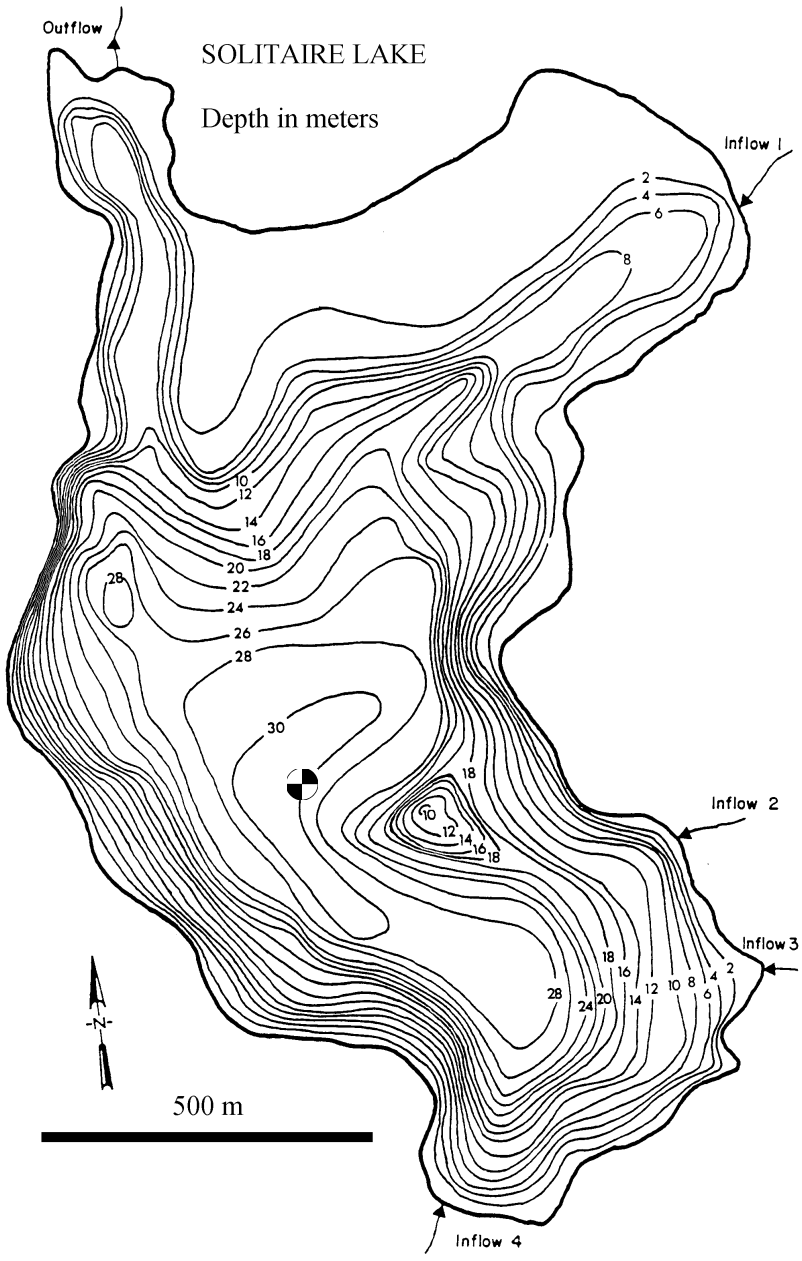


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Solitaire Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
124.0	164.0	13.3	31.0	5.98	1.51	1.29

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	124	
		22.2
2	98.6	
		18.7
4	88.9	
		17.1
6	82.3	
		15.7
8	74.9	
		14.2
10	66.8	
		12.7
12	60.6	
		11.5
14	54.5	
		10.4
16	49.0	
		9.27
18	43.7	
		8.22
20	38.6	
		7.23
22	33.8	
		6.24
24	28.7	
		5.12
26	22.6	
		3.53
28	13.1	
		1.56
30	3.52	
		0.117
31	0.00	

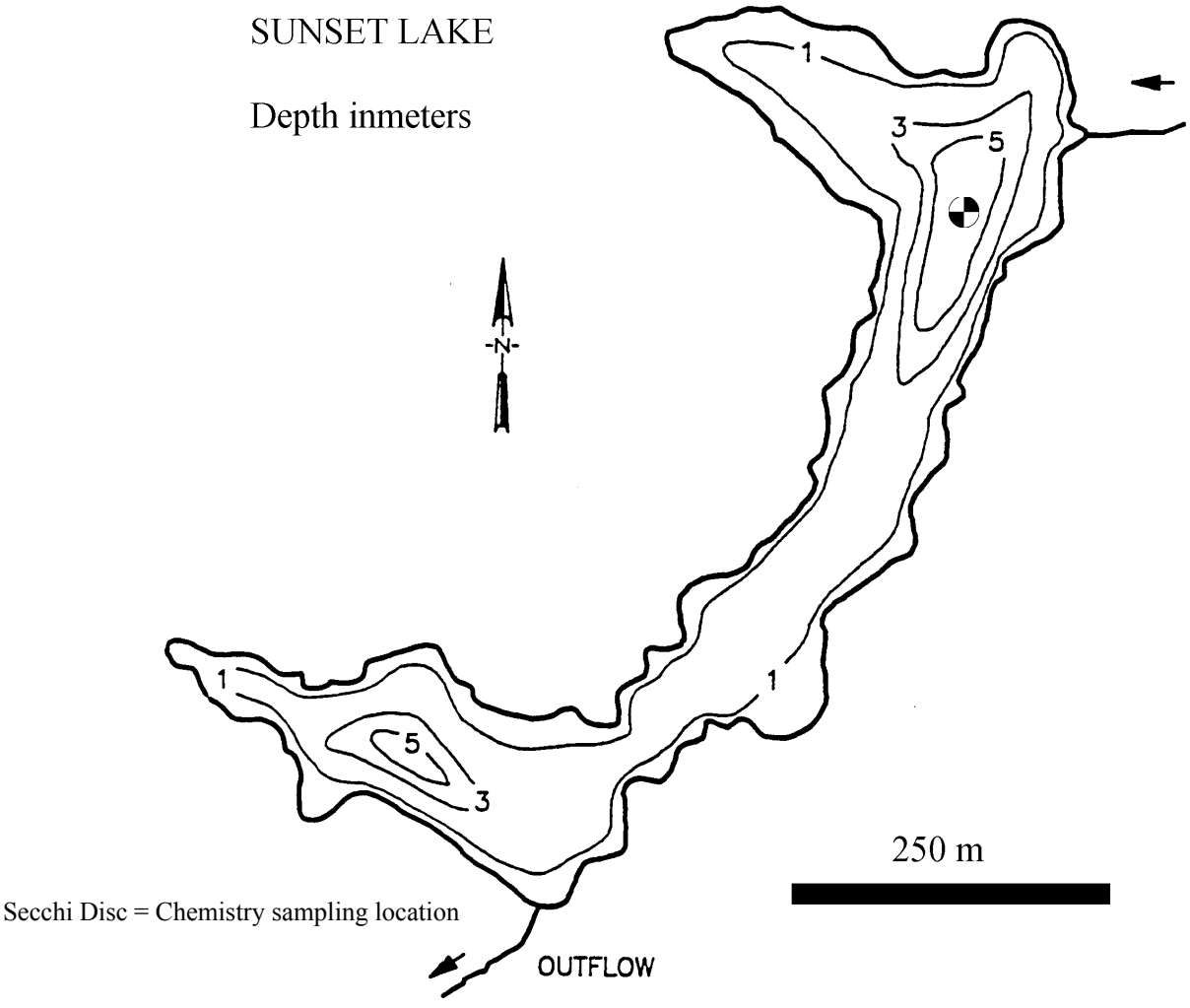


Secchi Disc = Chemistry sampling location

Sunset Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $\bar{z}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
12.94	2.36	1.82	6.5	3.11	2.44	0.84

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	12.94	
		1.73
2	4.72	
		0.49
4	1.31	
		0.14
6.5	0.00	

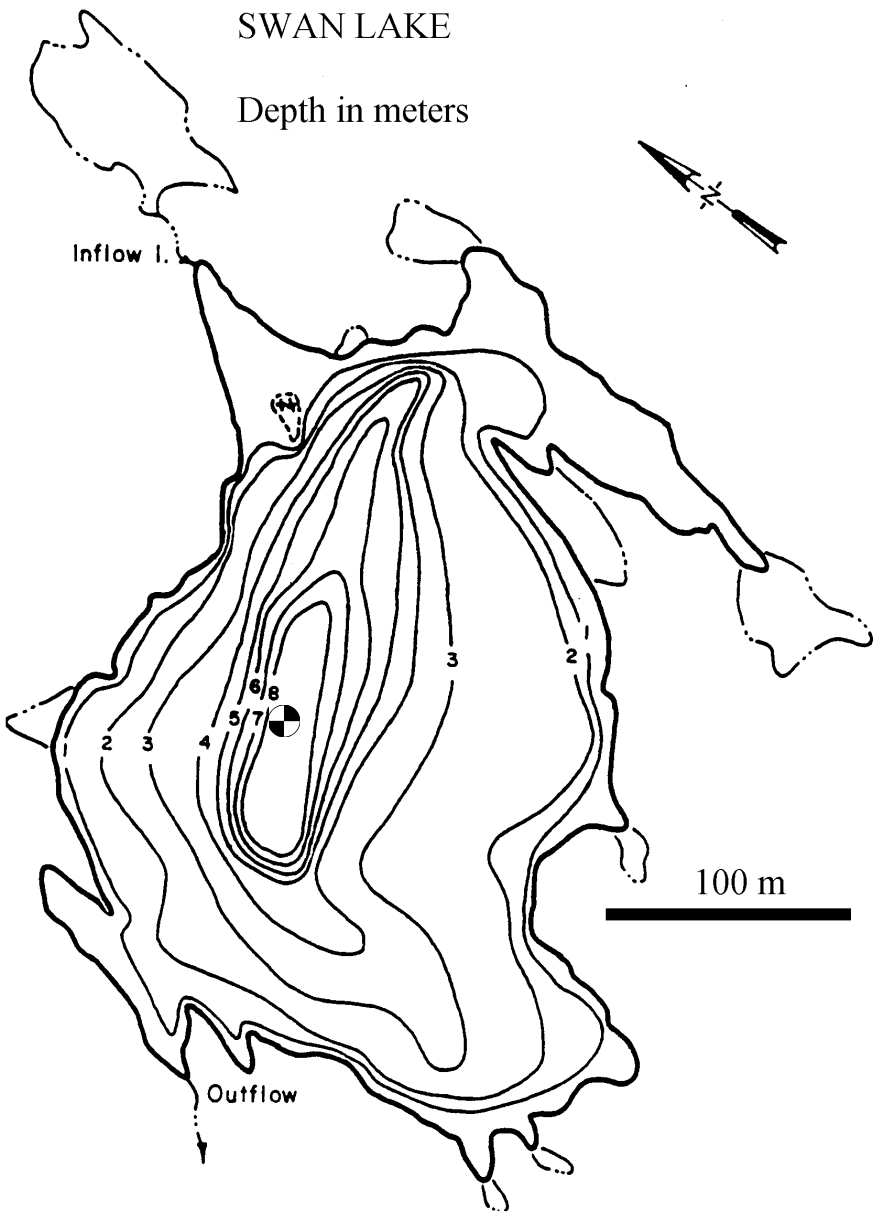


Secchi Disc = Chemistry sampling location

Swan Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
5.78	1.62	2.8	8.8	1.59	1.87	0.96

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	5.78	
		0.514
1	4.53	
		0.411
2	3.71	
		0.284
3	2.04	
		0.160
4	1.18	
		0.101
5	0.846	
		0.070
6	0.564	
		0.045
7	0.339	
		0.028
8	0.217	
		0.006
8.8	0.000	

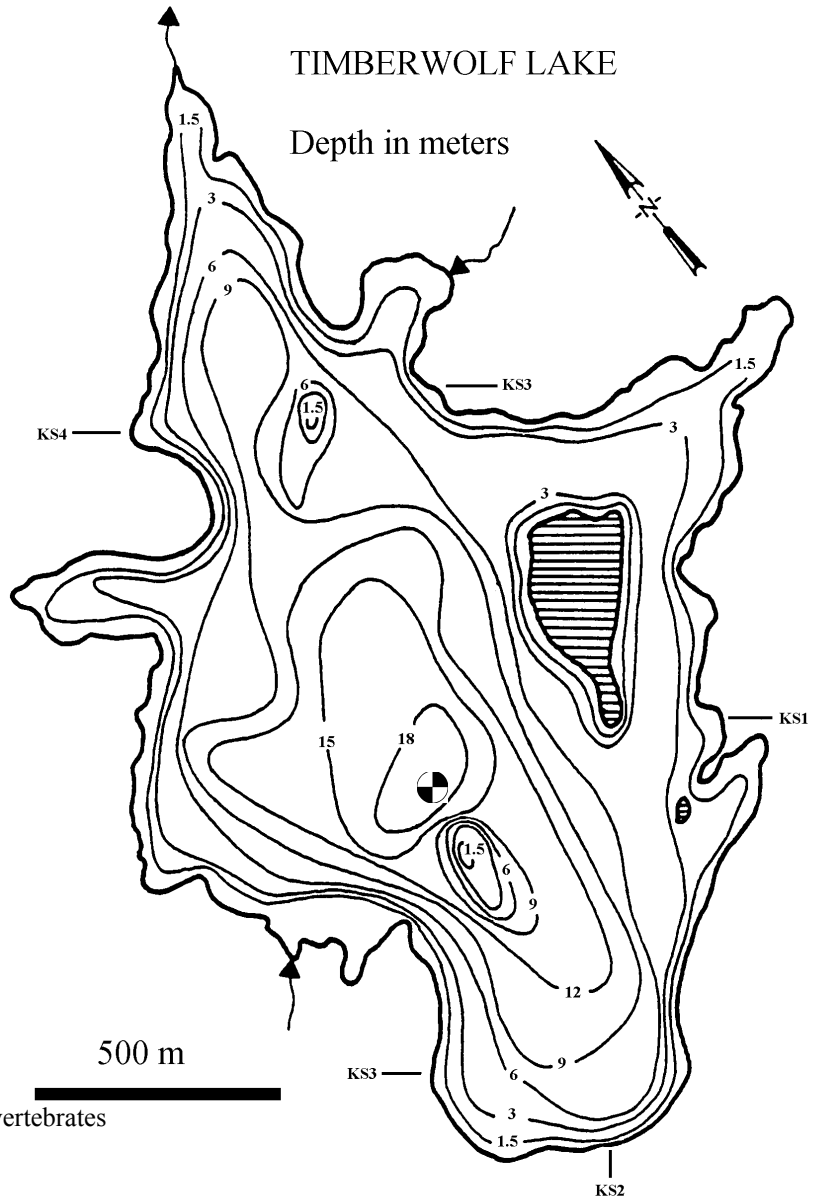


Secchi Disc = Chemistry sampling location

Timberwolf Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
167.0	124.0	7.4	20.4	8.34	1.82	1.09

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	167.0	
		30.8
2	141.0	
		25.6
4	116.0	
		20.4
6	88.8	
		15.7
8	68.7	
		11.9
10	50.7	
		8.55
12	35.3	
		5.77
14	22.9	
		3.23
16	10.3	
		1.50
18	5.09	
		0.549
20	0.950	
		0.013
20.4	0.000	

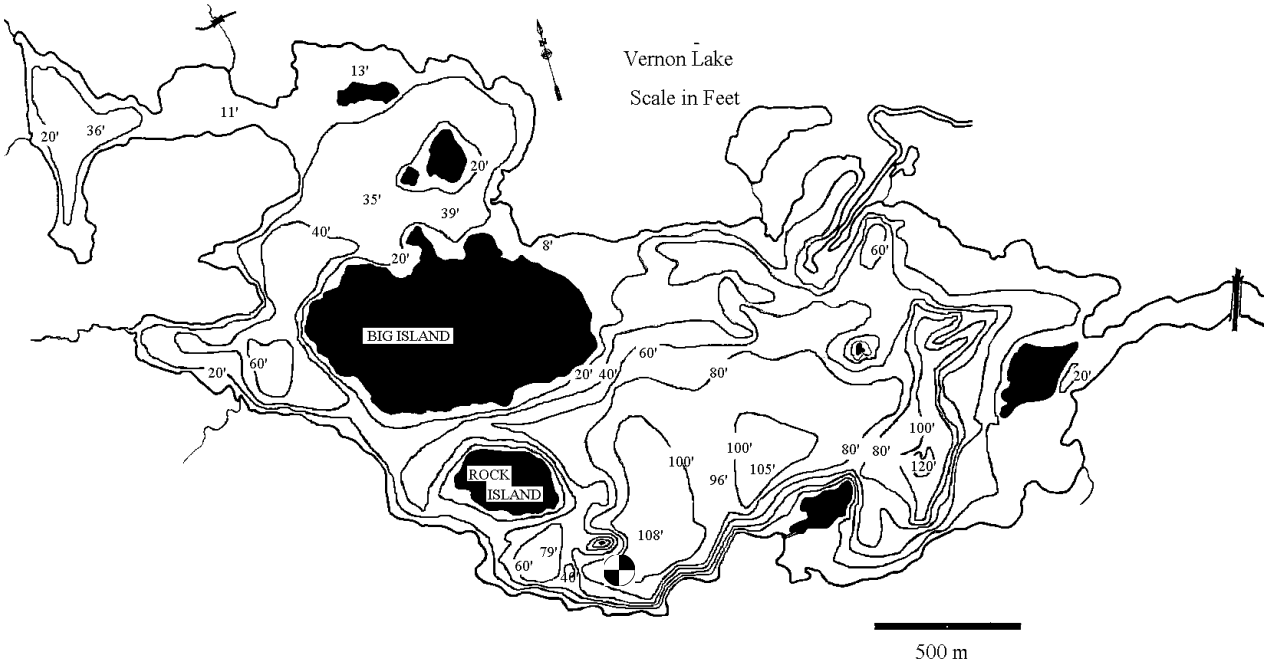


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi disc = Chemistry sampling site
Inflow # = inflowing streams

Vernon Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
1454	1912	13.15	36.58	35.68	2.64	1.08

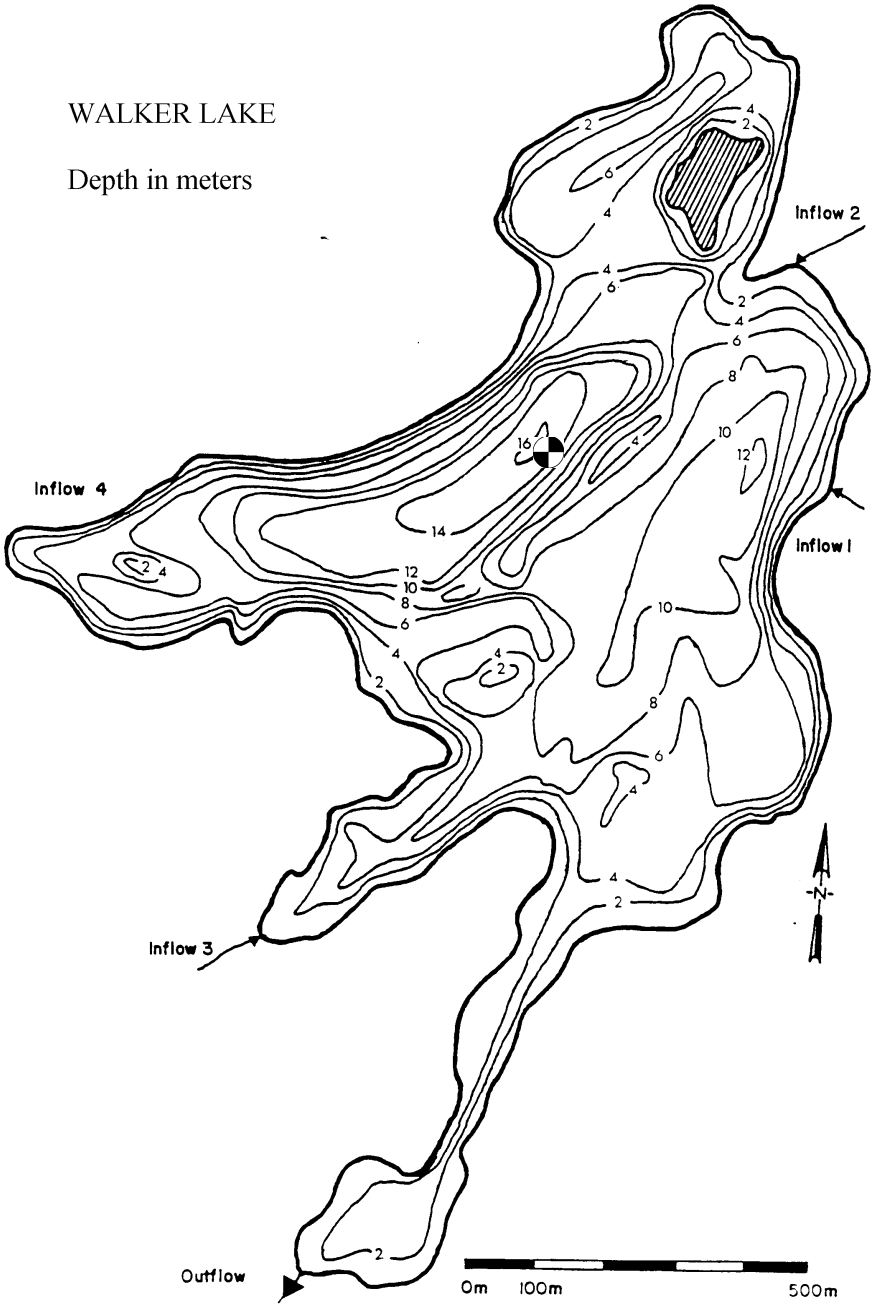
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)	Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
			20	379.7	
0	1454				71.08
		274.9	22	331.7	
2	1296				61.82
		244.1	24	287.0	
4	1146				51.46
		215.1	26	224.7	
6	1006				38.89
		188.3	28	165.7	
8	879				28.00
		163.8	30	115.8	
10	760.8				18.12
		141.1	32	65.13	
12	651.2				8.941
		122.0	34	27.03	
14	571.8				2.971
		107.1	36.58	0.00	
16	499.7				
		93.15	Secchi Disc = Chemistry sampling location		
18	432.5				
		81.02			



Walker Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
68.2	42.1	6.2	17.0	6.44	2.20	1.09

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	68.2	
		12.6
2	58.2	
		10.5
4	46.8	
		8.07
6	34.3	
		5.32
8	19.6	
		3.04
10	11.2	
		1.65
12	5.63	
		0.715
14	1.86	
		0.155
16	0.08	
		0.003
17	0.00	

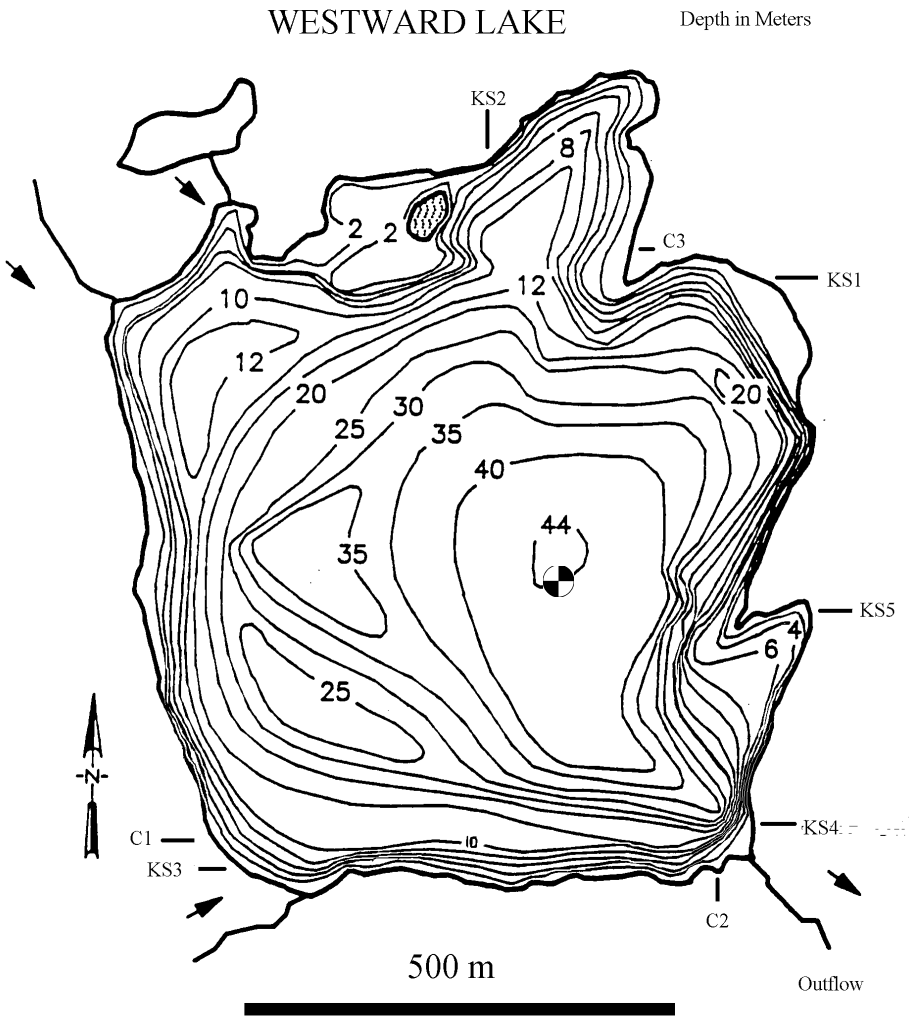


Secchi Disc = Chemistry sampling location

Westward Lake morphometry summary

Lake Area A (ha)	Lake Volume V (m^3x10^5)	Mean Depth $z\bar{x}$ (m)	Maximum Depth Zm (m)	Shoreline Length L (km)	Development of Shoreline D_L	Development of Volume D_v
63.0	129.5	20.54	44.0	3.52	1.25	1.40

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	63.3	12.14
2	58.4	11.34
4	55.0	10.81
6	53.1	10.28
8	49.7	9.57
10	46.1	8.65
12	40.5	14.88
16	34.0	12.91
20	30.6	13.80
25	24.8	10.86
30	18.8	7.97
35	13.2	5.04
40	7.22	1.24
44	0.383	

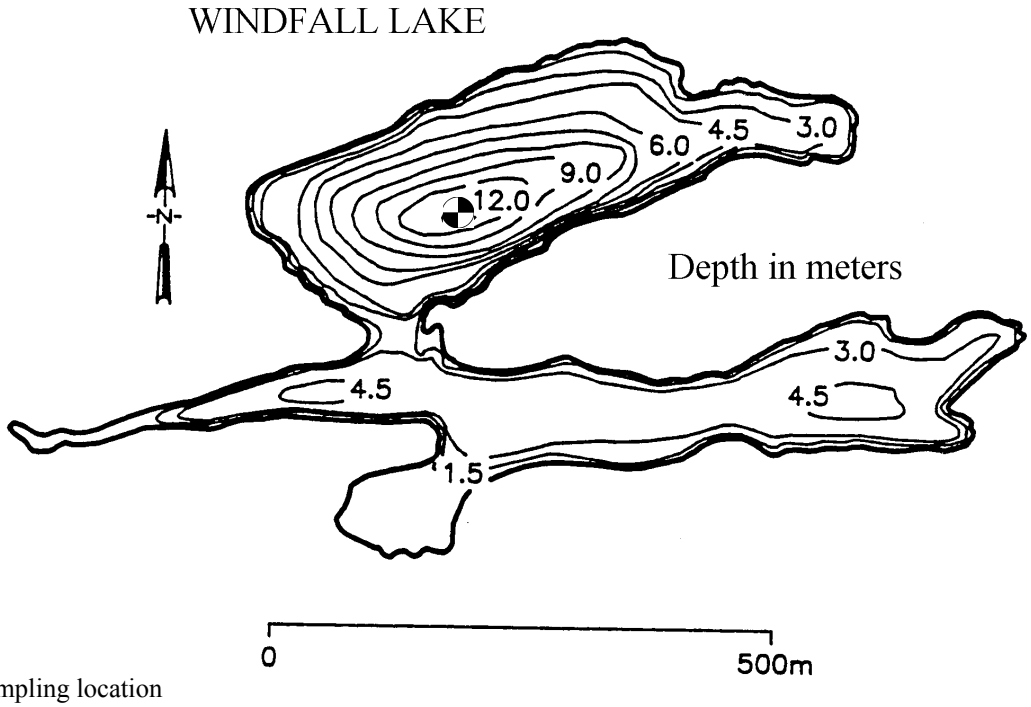


KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi disc = Chemistry sampling site
Inflow # = inflowing streams

Windfall Lake morphometry summary

Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
25.7	11.16	4.35	13.8	4.62	2.57	0.95

Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	25.66	
		4.53
2	19.78	
		3.24
4	11.11	
		1.55
6	5.61	
		0.929
8	3.73	
		0.579
10	2.05	
		0.269
12	0.74	
		0.062
13.8	0.00	

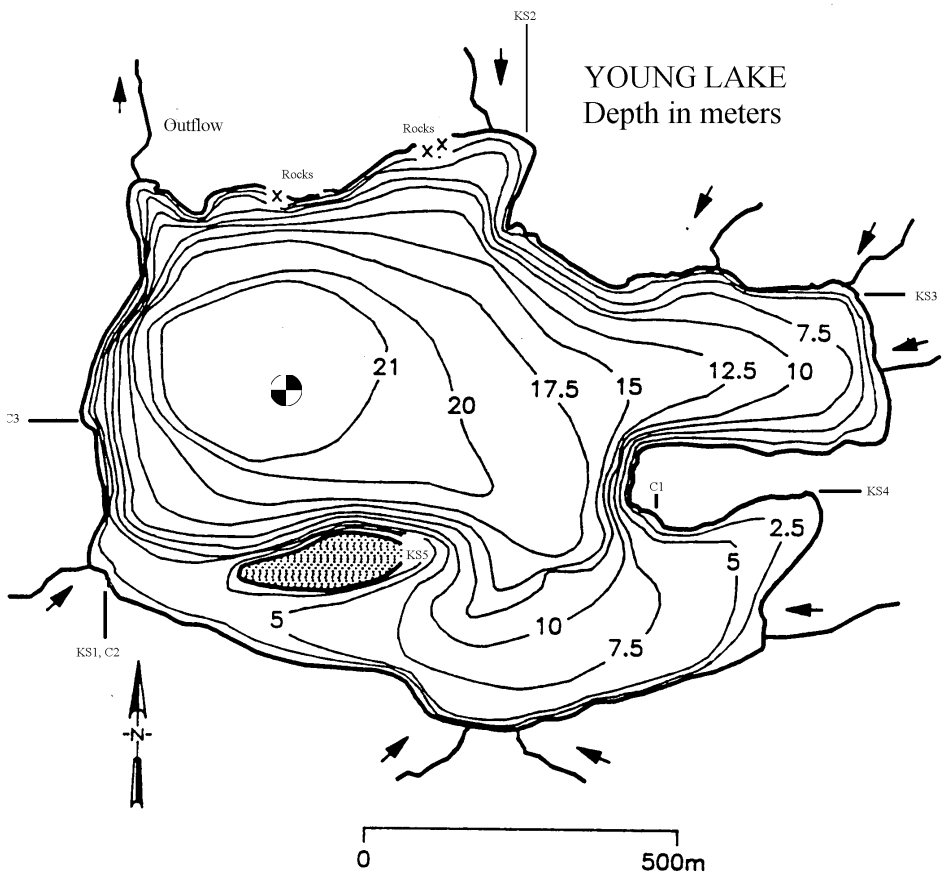


Secchi Disc = Chemistry sampling location

Young Lake morphometry summary

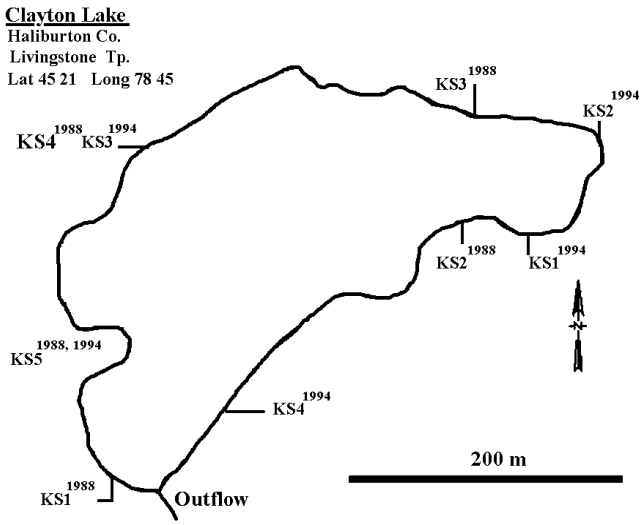
Lake Area A	Lake Volume V	Mean Depth $z\bar{x}$	Maximum Depth Zm	Shoreline Length L	Development of Shoreline	Development of Volume
(ha)	(m^3x10^5)	(m)	(m)	(km)	D_L	D_V
105.9	127.4	12.03	21.1	5.97	1.64	1.71

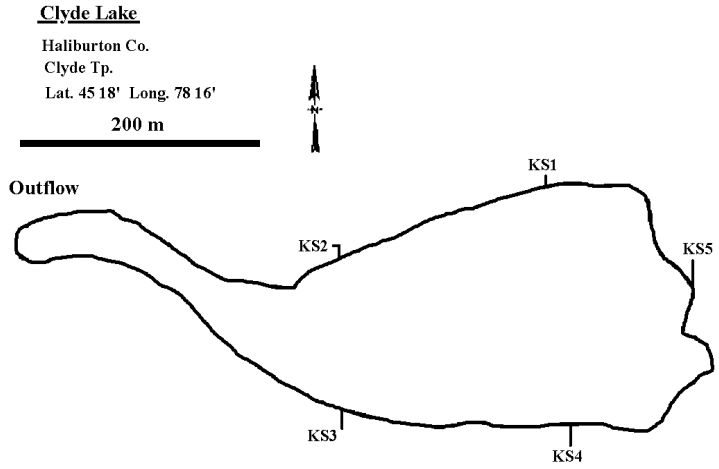
Contour Depth (m)	Contour Area (ha)	Stratum Volume (m^3x10^5)
0	105.9	
		20.46
2	98.72	
		18.97
4	90.82	
		17.27
6	80.95	
		15.07
8	70.06	
		13.07
10	60.75	
		11.34
12	52.72	
		9.814
14	45.60	
		8.413
16	38.13	
		6.812
18	29.21	
		4.721
20	18.42	
		1.457
21.1	0.00	

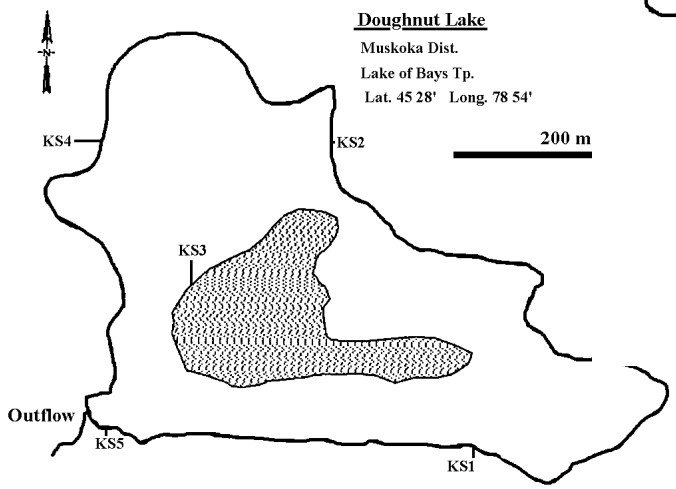


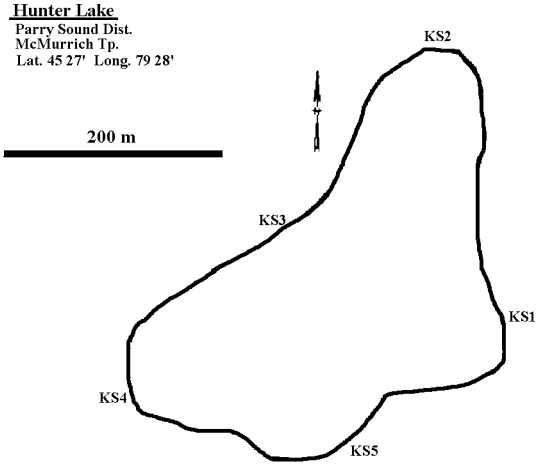
KS = Kick and Sweep sites for benthic macroinvertebrates
C = Crayfish trap sampling sites
Secchi Disc = Chemistry sampling location
Inflow # = inflowing streams

Littoral zone benthic macroinvertebrate sampling sites at lakes without morphometry

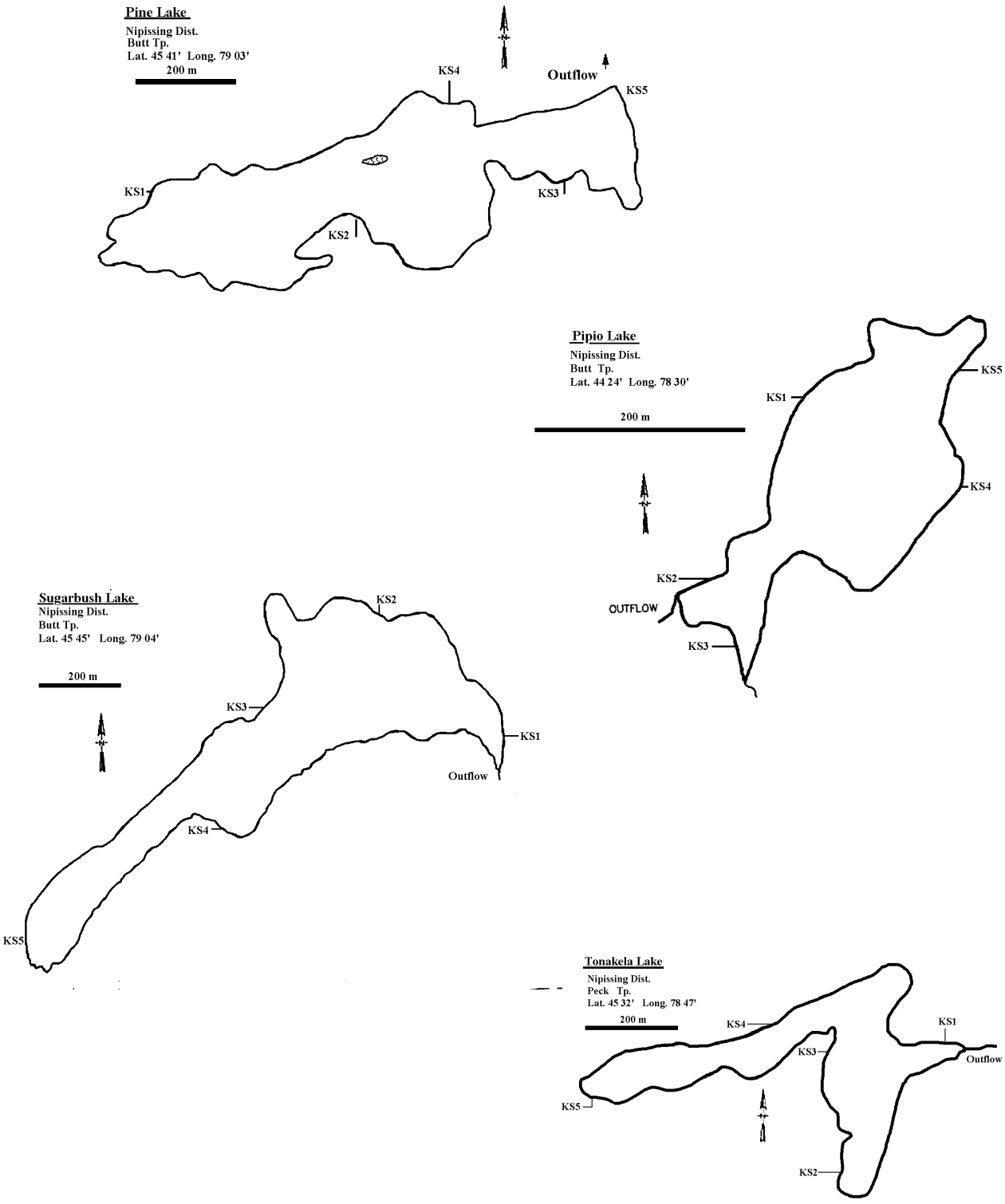








Littoral zone benthic macroinvertebrate sampling sites at lakes without morphometry



Appendix 2

Sample Submission to MOE and Trent Labs at the DESC

General

In June 2000 the procedures changed for submitting samples to the chemistry labs in Dorset. These changes were necessary to allow tracking of sample information from the new Trent Labs to the DESC database. Changes were also necessary to reduce the amount of effort required to log samples onto the Ministry LIMS system. In future, field data will be loaded to Oracle tables directly from the electronic versions of the Sample Submission and Field Data Forms. The person submitting the samples will be responsible for filling out the forms completely and correctly. Generally, the changes have made the process of submitting samples more accurate and efficient.

What has changed

- The old LIMS Routine Sample Submission Form has been replaced by the Sample Submission and Field Data Form which is a more compact, spreadsheet-style form.

- Samples can now be submitted to either MOE or Trent Labs using the same form. Note that all sample LAB SAMPLE NUMBERS are assigned by the MOE lab regardless of the sample's destination.

- "Field data" is still recorded on the submission forms by whoever is submitting samples. However, this information is not included on the portion of the submission form that accompanies the samples to the lab. The field data will be entered directly to the *ALL_SAMPLES* table in the DESC, Oracle database using an automated system which will read the electronic version of the Sample Submission and Field Data Form. Field data was previously included on sample submission forms and entered into the database by MOE Lab staff.

- Persons submitting samples to the lab must now keep track of the sample's LAB SAMPLE NUMBERS. These numbers must accompany the field data to allow the database to match field data to the sample analysis information that returns from the labs directly to the *ALL_RESULTS* table in the DESC Oracle database. The automated system will not record fields until the LAB SAMPLE NUMBERS have been entered.

- Condition Codes have been replaced by the Sample Description Field.

- Two new field data descriptors - Sample Gear Type and Special Study ID have been added to make data retrieval easier and more precise.

The "Sample Submission and Field Data" Form

This manual will deal with two different aspects of entering sample information into the DESC Oracle database.

Part 1 outlines the physical submission of samples to the chemistry lab(s). The information required to submit samples is entered into the left hand portion of the Sample Submission and Field Data Form. Note that the sample submission information and the results for each requested analysis will find its way back to the DESC, Oracle database. This is done by other people.

Part 2 outlines the entry of any "field data" associated with submitted samples to the DESC, Oracle database. Field data is entered into the right side portion of the Sample Submission and Field Data Forms. The electronic versions of the forms will be stored in designated directories. The field data will be loaded to Oracle tables automatically, after which the forms are placed into special Archive directories. In the past, the field data was entered onto the sample submission sheet and entered into the LIMS system by the staff in the chemistry lab. The field data would return to the database with the results of the analysis.

Part 1: Sample Submission *(the left hand portion of the form)*

Sample Submission and Field Data Forms have been produced in generic formats for the submission of samples from various sources i.e., lake, stream, precip, etc. These can be found in: *Desc_ntfs1\Public\Sample Submission and Field Data Forms\Blank Forms* (See example in Appendix 1).

These forms include all of the same information that was recorded on the old LIMS forms. The key difference is that only the left portion of the form is printed to use as a sample submission form. This is because lab personnel are no longer entering the field data that is recorded on the right hand portion of the sheet. This field data will be entered into Oracle tables automatically. The critical step is to include the LAB SAMPLE NUMBERS that are assigned to the samples by the lab onto your electronic copy of the submission form. These numbers must be entered onto the forms before the field data can be entered into Oracle tables. The MOE lab assigns LAB SAMPLE NUMBERS to each sample by attaching a sticky label to the sheet.

Client ID and Program Codes

These codes change on an annual basis. You must determine which Client ID to use and enter a valid program code to submit samples to the MOE lab. The Trent Lab at this point does not require these codes.

Station ID Code

Sample station information is stored in two tables in *geographic_mgr*. The lake that the water has been taken from or the lake that the stream flows into will be described in *geographic_mgr_body_of _water*. Each body of water may have multiple stations and these will by listed together with the body of water code in the *geographic_mgr_stations* table. Determine the station based on the description and enter the 11 digit number with your data. If you are sampling a new station you will be required to add information about the new location to the *geographic_mgr_stations* table and possibly to the *geographic_mgr_body_of _water* table. This will allow the creation of a new Station ID code. You will need to get in touch with a database person to do this.

Parent Product and Product Codes

These codes determine which tests are being requested for the samples that are being submitted. These codes often change so check for current valid codes. Generally if you are repeatedly asking for the same suite of parameters there will be a Parent Product code set up for you. This saves listing individual test or product codes. For example DRCSTRMB is a parent product code used to request all of the routine Dorset streams chemistry tests. Individual products can be entered as required i.e., TP3036 for total phosphorus. See the MOE chemistry lab personnel for valid parent product and product codes.

Trent Lab Submissions will not use Parent Products. Product Codes for the Trent Lab usually include the parameter name with a "TR" prefix i.e., TRDOC, TRPPUT, etc.

Part 2: Field Data *(the right hand portion of the form)*

The field data that are entered on the right hand portion of the Sample Submission and Field Data Form will be unique to the type of sample that is being submitted. All samples require a SAMPLE TYPE AND GEAR TYPE. Lake samples will require a great deal of additional field data including TYPE, LAYER, SDEPTH, BGDEPTH, WDEPTH, etc. Stream samples require only a SDESC (Sample Description) and sometimes TEMP. Some samples such as those that originate from a lab experiment may require no further entry of field data. Samples of all types collected for special studies require a SPECIAL_STUDY_ID.

Field data will be transferred automatically to the DESC, Oracle database, *ALL_SAMPLES* table. Therefore, field data can be entered for only those parameters that exist in the *ALL_SAMPLES* table. Again make sure that the lab assigned LAB SAMPLE NUMBER for each sample is added to your field data after the field data has been entered. It will be required to upload the data.

Form Fields - Explanations and Codes

Subsets of these "Fields" will be used depending on the origin of the samples.

STATION	11 digit sample location number from *geographic_mgr_stations* table
DATE	sample collection date

TIME	sample collection time
INITIAL DATE	start of sample period, initiation date
INITIAL TIME	start of sample period, initiation time
SUBNUM	first part of the LAB SAMPLE NUMBER - assigned by Lab staff
FIELD SAMPLE NUMBER	second part of the LAB SAMPLE NUMBER - entered by field staff (In most cases the first sample starts with the number 1, each subsequent sample increments by 1)

LAB SAMPLE NUMBER — Combined SUBNUM and FIELD SAMPLE NUMBER

Each sample submitted for analysis to an MOE or TRENT lab **must** have a Lab Sample Number**.**

It is the responsibility of the person submitting the samples (this means you) to enter the FIELD SAMPLE NUMBER and to add the SUBNUM to each form when it becomes available. The LAB SAMPLE NUMBER field is updated automatically when the SUBNUM is entered. Field data cannot be loaded to the Oracle tables until the Lab Sample Numbers have been added to the completed forms. *Make sure that the field data information on the form is complete before adding the Lab Sample Numbers.* It is a good idea to establish a routine (weekly or bi-weekly) to retrieve the Subnums from the lab and add them to the forms.

Procedure for adding Lab Sample Numbers

1. Check that all of the required field data has been added to the form
2. Make sure that the Field_Sample column is filled out. Field Samples always start with 1 and increment by 1.
3. Retrieve the Subnum from the Chemistry Lab and enter it into Cell S1 on the Sample Submission and Field Data Forms. The Lab Sample Number column will be updated automatically.
4. Save the file.
5. *Note that for some non-routine submissions the Field_Sample column may not meet the above criteria. In these cases the Lab Sample Number column must be filled out manually.*

STYPE sample type

10	profile	lakes
11	grab sample (single depth)	lakes, streams, groundwater
12	depth composite	lakes
61	wet only collector	precip
62	bulk collector	precip
63	on ground snow	precip
71	groundwater	standpipes (or, Piezometers) and Lysimeters
75	soils	individual horizon analysis

Sample Submission Methodological Changes :

Sample Submission methods have previously been described in:

Data Report: DR 88/8

McMormick, S. A. 1989. User Manual For The Lab Information System (LIS) Dorset Research Centre, Updated from Nov. 8, 1984, Nov. 12, 1985, Mar. 17, 1986, Aug. 25, 1988 and Sept. 14, 1989

Methodological change occurred in June 2000 when a summary was prepared for the purpose of tracking sample information from the new Trent Labs to the DESC database. The report is titled: Sample Submission to MOE and Trent Labs at the Dorset Environmental Science Centre. July, 2000. This latter report did not fully summarized the historical sample submission methods previously described by McCormick 1989 The MOE TRENT sampling method codes were inconsistent with historical method codes.

Historical Note 1: The STYPE (sample type) codes are provided in order to link the historical sample gear type codes to specific sample types, otherwise the repeated use of the #1 etc shown below would be ambiguous. Note 2.: STYPE 01 represents any sample gear type quality control replicates The historical 1980 – 2000 "Sample Type" and "Sample Gear Type" should be compared with values in the MOE – Trent 2000 – 2006 description in order to verify the field method compatibility

MOE – TRENT 2000 - 2006

Sample Gear Type

1 hand sample – bottle filled by hand (all media)
2 peristaltic pump (lake / groundwater)
3 Van Dorn or Kemmerer Bottle (lake)
4 Tube composite (lake)
5 Composite bottle (Space age sampler) (lake)
6 Sangamo collector (precip)
7 Aerochemmetric collector (precip)
8 MIC collector (precip)
9 Bulk collector (summer funnel) (precip)
10 Bulk collector (winter funnel) (precip)
11 Hand held manual pump (groundwater)
12 Lysimeter (zero tension) (groundwater)

Historical 1980 - 2000

Sample Gear Type (lakes) STYPE 10 - 12

1. peristaltic pump
2. Van Dorn or Kemmerer Bottle
3. Tube composite
4. Composite bottle
9.Other more info exists on method

Sample Gear Type (precip) STYPE 61, 62

1. Bulk collector (all season) STYPE 62
2. Aerochemmetric STYPE 61
3. MIC collector STYPE 61
9.Other more info exists on method

Gauge Code (precip) STYPE 62 - 63

0. SRG (standard rain gauge) STYPE 62
1. Nipher gauge STYPE 62
3. Belfort gauge STYPE 62
4. Measured depth of snow STYPE 63
9. no gauge or gauge malfunction

Standpipe (Piezometers) & Lysimeters (Soils) STYPE 75

1. 15.3 cm tension porcelain plate
2. 36 cm by 15,3cm zero tension plexiglass plate

4 Standpipes bailed

5 Standpipes pumped

Sample Gear Type (streams) STYPE 11

8 hand grab sample

Procedure for adding Lab Sample Numbers resumed

CONT. SENT number of sample containers submitted for each sample

LDESC sample location description (i.e. BC-EPI)

SDESC sample description, NOTE NEW - add information that would be recorded as former CONDITION_CODE (i.e., pollen in sample, etc.)

SDEPTH sample depth or top of composite for type 12 samples

BGDEPTH bottom of composite sample for type 12 samples

WDEPTH depth of water at sample location

WLAYER	1	whole lake composite	(spring and fall turnover)
	2	epilimnion	
	3	metalimnion	
	4	hypolimnion	
	5	euphotic zone (surface to 2 x Secchi)	
	8	grab (Kemmerer etc. use with type = 11)	
	9	general layer (0-5m composite etc.)	

TEMP Water temperature

SAMPLE_GEAR_

	1	hand sample - bottle filled by hand	(all media)
TYPE	2	peristaltic pump	(lake / groundwater)
	3	Van Dorn or Kemmerer Bottle	(lake)
	4	tube composite	(lake)
	5	composite bottle (space age)	(lake)
	6	Sangamo collector	(precip)
	7	Aerochemmetric collector	(presip)
	8	MIC collector	(precip)
	9	bulk collector (summer funnel)	(precip)
	10	bulk collector (winter funnel)	(precip)
	11	hand held manual pump	(groundwater)
	13	lysimeter (zero tension)	(groundwater)

SPECIAL STUDY_ID - By entering a unique number into this field it will be possible to retrieve all of the data from the database associated with your study. It simply creates an easy way to query your data. If you plan to submit samples as part of a unique study, Joe will assign you a SPECIAL_STUDY_ID which will be entered into a separate table with a study description.

Step by Step

1. Ensure that every sample bottle is labeled with either a Field Sample I.D. number, or a clear Sample Location Description (LDESC), eg: PC - EPI.

2. Call up a generic Sample Submission and Field Data Form from the directory - *Desc_ntfs1\Public\Sample Submission and Field Data Forms\Blank Forms.* From the subdirectories choose a *lake* form for lake samples, a *stream* form for stream samples etc.

3. Enter the sample information into the form and save it using a descriptive file name *(i.e. DickieStreams150600.xls*) in the following directory - *Desc_ntfs\Public\Sample Submission and Field Data Forms\Completed Forms* . Choose the appropriate subdirectory from here. Field sample information will be uploaded to the Oracle tables from these directories.

4. Print the left hand portion of the submission form including all columns over to and including the PRODUCT column.

5. Leave the sample submission form together with the samples on the counter in the MOE lab sample reception area. Note that if you are requesting both MOE and Trent Lab tests, you should leave two copies of the submission form and instruct the chem lab to send one form to the Trent Lab with the associated bottles. If you are submitting samples only to the Trent Lab, MOE lab staff will assign special LAB SAMPLE NUMBERS to each sample and these will go with the sheets to the Trent Lab. These numbers will not be logged onto the LIMS system.

6. It will take the lab staff some time to assign LAB SAMPLE NUMBERS to your samples. You will have to return to the MOE lab at some point after the samples have been logged in and record these LAB SAMPLE NUMBERS on your copy of the Sample Submission and Field Data Form. Make sure the field data is complete before adding the Lab Sample Numbers. Lab Sample Numbers can be found in the log book or on the face (as sticky labels) of the submission sheets that you left with the samples. They may be in a filing cabinet if you have waited for several days. Put these numbers into the LAB SAMPLE NUMBER column on the left side of your electronic version of the Sample submission and field data file. Alternatively you can enter the SUBNUM into cell S1 and the LAB SAMPLE NUMBER column will be filled in automatically.

Detailed Instructions for Completing the Sample Submission and Field Data Forms

1. Open a blank form

Open Windows Explorer

Go to : Public on 'Desc_ntfs1'
Sample Submission and Field Data Forms
BLANK_FORMS
appropriate Subdirectory

Select the appropriate GENERIC form and double click to open

OR

- Open Excel

Go to the above directory and select the appropriate form.

2. Enter field data into the form

Enter the date in dd/mm/yy format and the time in hh:mm format. Use the copy and paste functions to enter repetitive information.

To copy:

click on the cell you want to copy

from the menu select Edit / Copy <u>OR</u> click the right mouse button and select Copy

highlight the cells you wish to copy to by clicking and holding the left mouse button while you cursor over the cells

from the menu select Edit / Paste <u>OR</u> click the right mouse button and select Paste

Make changes to the Cont. Sent and PRODUCT and PARENT PRODUCT cells if required.

Enter the required data into the Field Data Portion of form.

Check the form to see if any other changes are required.

3. Print the form

Either set the print area by selecting *File/Print Area/Set Print* Area followed by *File/Print*

OR

Highlight the area you wish to print (all completed rows and all columns up to and including PRODUCT) followed by *File/Print/Selection*

Enter the number of copies required

Click OK

1. Save the completed form

- From the menu select File / Save A

Go to : Public on 'Desc_ntfs1'

Sample Submission and Field Data Forms

COMPLETED_FORMS

Appropriate Subdirectory

- Click in the File name box to highlight the name

Change the name of the blank form to a meaningful, descriptive name such as:

SampSub*ddmmyyLakename*.xls

(eg. **SampSub170600Chalks.xls**)

Make sure that the Save as type box says Microsoft Excel worksheet (*.xls)

Push the Save button located at the top, right.

That's it, you're finished.

1. Exiting Excel or opening another form

If this is your only submission click on the **X** on the very top right to exit Excel.

If you have another submission, click on the **X** just below the very top one to close the form that you just completed, printed and saved.

You can now repeat the process for another submission.

Appendix 3

Lake Specific

Sample Volume Proportions for the

"Volume - Weighted Composite Sample Technique "

(1973 - 2006)

Axe Lake (AX)

Depth (m)	Sample Depth	Volume (ml) 4000	8000
0-2	1	1846	3692
2-4	3	779	1557
4-6	5	580	1160
6-8	7	402	804
8-10	9	253	505
10-12	11	113	226
12-14	13	23	47
14+		4	9

Sample Protocol (1990-1998) (3) epilimnion 0 - 8m, metalimnion 8 - 10m, hypolimnion 10 Zmax

Basshaunt Lake (BH) (211 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1840	920	460
2-4	3	1544	772	386
4-6	5	1210	605	303
6-8	7	922	461	230
8-10	9	682	341	170
10-12	11	550	275	138
12-14	13	428	214	107
14-16	15	306	153	77
16-18	17	226	113	56
18-20	19	162	81	40
20-22	21	94	47	24

Sample Protocol (1990-1998) (4a) epilimnion 0 -10m, metalimnion 10 - 14m, hypolimnion 14 - Zmax

Bat Lake (S1)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	2325	1162
2-4	3	1165	583
4-6	5	365	183
6-8	7	128	64

Sample Protocol (1990-1998) (1a) epilimnion 0 -2 m, metalimnion 2 -4 m, hypolimnion 4 - Zmax

Lake Chemocline after 5m driven by H^2SO^4 throughout ice-free period (avoid contact, wear disposable gloves)

Big Porcupine Lake (BP)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	945	1890
2-4	3	744	1488
4-6	5	577	1154
6-8	7	448	896
8-10	9	349	698
10-14	12	448	896
14-18	16	242	484
18-22	20	132	264
22-24	23	44	88
24-26	25	29	59
26-28	27	18	36
28-30.5	29	12	24

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 -14 m, hypolimnion 14 - Zmax

Bigwind Lake (BW) (311 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1410	705
2-4	3	1248	624
4-6	5	1066	533
6-8	7	856	428
8-10	9	688	344
10-12	11	554	277
12-14	13	452	226
14-16	15	380	190
16-18	17	320	160
18-20	19	270	135
20-22	21	226	113
22-24	23	186	93
24-26	25	148	74
26-28	27	110	55
28-30	29	70	35
30-32	31	2	1

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 -14 m, hypolimnion 14 - Zmax

Blue Chalk Lake (BC) (91 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1688	844	422
2-4	3	1400	700	350
4-6	5	1206	603	302
6-8	7	996	497	249
8-10	9	750	375	188
10-12	11	588	294	147
12-14	13	500	250	125
14-16	15	408	204	102
16-18	17	268	134	67
18-20	19	140	70	35
20-22	21	14	7	4

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 -14 m, hypolimnion 14 - Zmax

Bonnechere Lake (BO)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1090	1635
2-4	3	824	1236
4-6	5	624	936
6-8	7	479	719
8-10	9	370	555
10-12	11	266	499
12-14	13	168	255
14-16	15	94	142
16-18	17	56	84
18-20	19	30	45
20-Zmax		8	12

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 -14 m, hypolimnion 14 - Zmax

Brandy Lake (BY)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1470	735
2-4	3	975	488
4-6	5	453	227
6- Zmax.		57	29

Sample Protocol (1990-1998) (1a) epilimnion 0 -4 m, metalimnion 4 -6 m, hypolimnion 6 - Zmax

Buck Lake (BK) (171 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1368	684	342
2-4	3	1198	599	300
4-6	5	1052	526	263
6-8	7	904	452	226
8-10	9	768	384	192
10-12	11	660	330	165
12-14	13	570	285	143
14-16	15	464	232	116
16-18	17	346	173	87
18-20	19	254	127	64
20-22	21	176	88	44
22-24	23	108	54	27
24-26	25	68	34	17
26-28	27	44	22	11
28-30	29	10	5	3

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 - 14m, hypolimnion 14 - Zmax

Chub Lake (CB) (111 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1620	810	405
2-4	3	1328	664	332
4-6	5	1090	548	234
6-8	7	890	445	213
8-10	9	740	370	185
10-12	11	682	341	171
12-14	13	500	250	125
14-16	15	384	192	96
16-18	17	296	148	74
18-20	19	220	110	55
20-22	21	156	78	39
22-24	23	100	50	25
24-26	25	32	16	8
26-28	27	1	0.5	0.25

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 - 14m, hypolimnion 14 - Zmax

Cinder (East) Lake (CIE)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1788	894
2-4	3	1401	701
4-6	5	1105	553
6-8	7	849	425
8-10	9	717	359
10-14	12	1159	580
14-18	16	884	442
18-22	20	704	352
22-26	24	571	286
26-28	27	250	125
28-30	29	206	103
30-32	31	167	84
32-34	33	125	63
34-36.5	35	73	37

Sample Protocol (1990-1998) (4b) epilimnion 0 -10 m, metalimnion 10 -16 m, hypolimnion 16 - Zmax

Cinder (West) Lake (CI)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	3725	1862
2-4	3	2842	1421
4-6	5	1862	931
6-8	7	955	478
8-10	9	338	169
10-12	11	162	81
12-14	13	87	44
14-16	15	26	13

Sample Protocol (1990-1998) (3) epilimnion 0 - 8m, metalimnion 8 -10 m, hypolimnion 10 - Zmax

Clara Lake (S4)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1492	746
2-4	3	1185	592
4-6	5	831	415
6-8	7	371	185
8-10	9	115	57
10-12	11	9	4

Sample Protocol (1990-1998) (2) epilimnion 0 - 6m, metalimnion 6 -8 m, hypolimnion 8 - Zmax

Clear Lake (CL)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1212	606	303
2-4	3	1052	526	263
4-6	5	908	454	227
6-8	7	816	408	204
8-10	9	732	366	183
10-12	11	652	326	163
12-14	13	572	286	143
14-16	15	496	248	124
16-18	17	420	210	105
18-20	19	348	174	87
20-22	21	276	138	69
22-24	23	208	104	52
24-26	25	148	74	37
26-28	27	96	48	24
28-30	29	56	28	14
30-33	31	20	10	5

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax

Clearwater Lake (CR)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1100	1650
2-4	3	900	1350
4-6	5	750	1125
6-8	7	600	900
8-10	9	500	750
10-12	11	400	600
12-14	13	350	525
14-16	15	250	325
16-18	17	150	225
18-20	19	100	150
20-Zmax.		50	75

Sample Protocol: Sample history treats the collection as a whole lake sample throughout the stratified period (1973 - 2003) "Sudbury Environmental Study" protocol.

Cradle Lake (S2)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	615	1230
2-4	3	560	1119
4-6	5	497	995
6-8	7	423	846
8-10	9	350	719
10-12	11	294	588
12-14	13	249	497
14-16	15	203	407
16-18	17	177	354
18-20	19	152	304
20-22	21	133	266
22-24	23	113	226
24-26	25	94	188
26-28	27	73	146
28-30	29	33	66
30-32	31	18	36
32-33.3		7	14

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10m, metalimnion10 - 14 m, hypolimnion 14 - Zmax

Crosson Lake (CN) (271 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1746	873	437
2-4	3	1454	727	364
4-6	5	1186	593	297
6-8	7	940	470	235
8-10	9	758	379	190
10-12	11	614	307	154
12-14	13	468	234	117
14-16	15	344	172	86
16-18	17	242	121	61
18-20	19	150	75	38
20-22	21	70	35	18
22-25	23	24	12	6

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax

Crown Lake (CW)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	704	1408
2-4	3	616	1232
4-6	5	534	1068
6-8	7	458	916
8-10	9	388	776
10-14	12	588	1176
14-18	16	377	754
18-22	20	218	436
22-24	23	60	120
24-26	25	36	72
26-28	27	18	36
28-32	30	8	16

Sample Protocol (1990-1998) (4b) epilimnion 0 -10m, metalimnion 10 - 16 m, hypolimnion 16 - Zmax

Crystal Lake (S3)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1407	2814
2-4	3	922	1844
4-6	5	651	1302
6-8	7	446	891
8-10	9	258	516
10-12	11	156	312
12-14	13	96	193
14-16	15	55	110
16-17.1		9	18

Sample Protocol (1990-1998) (3) epilimnion 0 -8m, metalimnion 8 - 10 m, hypolimnion 10 - Zmax

Delano Lake (DO)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	754	1508
2-4	3	573	1146
4-6	5	432	864
6-8	7	350	700
8-10	9	284	568
10-12	11	227	454
12-14	13	179	358
14-16	15	125	250
16-18	17	76	152

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax

Dickie Lake (DE) (91 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	2880	1460	720
2-4	3	2258	1129	565
4-6	5	1476	738	369
6-8	7	916	458	229
8-10	9	420	210	105
10-12	11	52	26	13

Sample Protocol (1990-1998) (2) epilimnion 0 - 6m, metalimnion 6 -8 m, hypolimnion 8 - Zmax

Drummer Lake (S5)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1875	957
2-4	3	1309	654
4-6	5	615	307
6-8	7	162	81
8-10	9	38	19

Sample Protocol (1990-1998) (2) epilimnion 0 - 6m, metalimnion 6 -8 m, hypolimnion 8 - Zmax

Fawn Lake (FN)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1458	792
2-4	3	915	458
4-6	5	492	246
6-Zmax.		117	59

Sample Protocol (1990-1998) (1a) epilimnion 0 - 4m, metalimnion 4 - 6 m, hypolimnion 6 - Zmax

Glen Lake (GN) (191 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	2048	1024	512
2-4	3	1748	874	437
4-6	5	1498	749	375
6-8	7	1212	606	303
8-10	9	796	398	199
10-12	11	432	216	106
12-14	13	240	120	60

Sample Protocol (1990-1998) (3) epilimnion 0 - 8m, metalimnion 8 -10 m, hypolimnion 10 - Zmax.

Gullfeather Lake (GF) (291 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	2954	1477	739
2-4	3	2220	1110	555
4-6	5	1430	715	358
6-8	7	824	412	206
8-10	9	422	211	106
10-13	11	144	72	36

Sample Protocol (1990-1998) (2) epilimnion 0 - 6m, metalimnion 6 -8 m, hypolimnion 8 - Zmax.

Hamer Lake (HR)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	2132	1599
2-4	3	1351	1013
4-6	5	385	288
6-8	7	132	100

Sample Protocol (1990-1998) (1a) epilimnion 0 - 4m, metalimnion 4 - 6 m, hypolimnion 6 - Zmax.

Hannah Lake (HH)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	2085	2605
2-4	3	1600	2000
4-6	5	1015	1270
6-Zmax.	7	295	368

Sample Protocol: Sample history treats the collection as a whole lake sample throughout the stratified period (1973 - 2003) “Sudbury Environmental Study” protocol.

Harp Lake (HP) (51 for phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1192	576	298
2-4	3	1036	518	259
4-6	5	910	455	228
6-8	7	806	403	202
8-10	9	714	357	179
10-12	11	614	307	158
12-14	13	528	264	132
14-16	15	458	229	115
16-18	17	386	198	99
18-20	19	340	170	85
20-22	21	280	140	70
22-24	23	226	113	57
24-26	25	172	86	43
26-28	27	120	60	30
28-30	29	86	43	22
30-32	31	54	27	14
32-34	33	30	15	8
34-36	35	18	9	5

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 -14 m, hypolimnion 14 - Zmax

Healey Lake (HE)

Depth (m)	Sample Depth	Volume (ml)	
0-1	0.5	1924	962
1-2	1.5	1490	745
2-3	2.5	1164	582
3-4	3.5	802	401
4-5	4.5	430	215
5-6	5.5	170	85
6-7	6.5	28	14

Sample Protocol (1990-1998) (1b) epilimnion 0 -4 m, metalimnion 4 - 5 m, hypolimnion 5 - Zmax
Sampling at mid point of one metre strata (interval from 0.5m to Zmax).

Heney Lake (HY) (431 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	4324	2162	1081
2-4	3	3064	1532	766
4-6	5	612	306	153

Sample Protocol: (1990-1998) Usually a 5.8m Zmax. And a whole lake sample.

Jerry Lake (JY)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	615	1229
2-4	3	552	1104
4-8	6	937	1874
8-12	10	737	1473
12-16	14	542	1084
16-18	17	202	405
18-20	19	156	312
20-24	22	166	332
24-28	26	62	123
28-32	30	28	56
32-34	33	5	9

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 -14 m, hypolimnion 14 - Zmax

Joe Lake (JO)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	653	1306
2-4	3	547	1095
4-6	5	466	931
6-8	7	398	796
8-10	9	342	685
10-12	11	293	585
12-14	13	253	506
14-16	15	219	438
16-18	17	191	383
18-20	19	166	332
20-22	21	139	278
22-24	23	111	222
24-26	25	82	164
26-28	27	57	115
28-30	29	42	83
30-32	31	30	61
32-34	33	14	27

Sample Protocol (1990-1998) (4a) epilimnion 0 -10 m, metalimnion 10 -14 m, hypolimnion 14 - Zmax.

Kimball Lake (KL)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	355	710
2-4	3	330	660
4-6	5	312	624
6-8	7	292	584
8-10	9	272	544
10-15	12.5	600	1200
15-20	17.5	492	984
20-30	25	704	1408
30-40	35	400	800
40-50	45	183	366
50-65	57.5	53	106

Sample Protocol (1990-1998) (4b) epilimnion 0 -10 m, metalimnion 10 -16 m, hypolimnion 16 - Zmax.

Labelle (Tower) Lake

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1195	2390
2-4	3	765	1530
4-6	5	395	790
6-8	7	125	250
8-10	9	20	40

Phytoplankton and Chlorophyll Samples

Sample Depth	Secchi 0-1m Depth	ml	Secchi 1-2m ml	Secchi 2-3m ml	Sample Depth	Secchi 3-4m
0-1	0.5	1120	680	570	1	965
1-2	1.5	880	535	445	3	620
2-3	2.5		435	365	5	320
3-4	3.5			290	7	100
4-5	4.5			205		
5-6	5.5			130		

Chemical Sample Protocol (1990-1998) (2) epilimnion 0 - 6m, metalimnion 6 - 8 m, hypolimnion 8 - Zmax.

Leech Lake (LH)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1804	902
2-4	3	1456	728
4-6	5	1120	560
6-8	7	806	403
8-10	9	518	259
10-12	11	250	125
12-14	13	42	21

Sample Protocol (1990-1998) (2) epilimnion 0 -6 m, metalimnion 6 -8 m, hypolimnion 8 - Zmax.

Leonard Lake (LD)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1044	2088	6264
2-4	3	840	1680	5040
4-6	5	660	1320	3960
6-8	7	508	1016	3048
8-10	9	404	808	2424
10-12	11	312	624	1872
12-14	13	184	368	1104
14-15.2		48	96	288

Sample Protocol (1990-1998) (3) epilimnion 0 -8 m, metalimnion 8 - 10 m, hypolimnion 10 - Zmax.

Little Eastend Lake (S6)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1128	564
2-4	3	898	449
4-6	5	750	375
6-8	7	594	297
8-10	9	393	197
10-12	11	166	83
12-14	13	61	31
14-15.5	15	11	5

Sample Protocol (1990-1998) (3) epilimnion 0 - 8, metalimnion 8 - 10, hypolimnion 10 - Zmax.

Little Clear Lake (LC) (151 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1796	898	449
2-4	3	1526	763	382
4-6	5	1308	654	327
6-8	7	1074	537	269
8-10	9	816	408	204
10-12	11	552	276	138
12-14	13	356	178	89
14-16	15	228	114	57
16-18	17	158	79	40
18-20	19	104	52	26
20-22	21	58	29	15
22-25	23	18	9	5

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Little Whetstone Lake (S16)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1824	3648	1368
2-4	3	899	1798	674
4-6	5	537	1074	403
6-8	7	360	720	270
8-10	9	221	442	166
10-12	11	129	258	97
12-13.6		36	72	27

Sample Protocol (1990-1998) (2) epilimnion 0 -6 m, metalimnion 6 - 8 m, hypolimnion 8 - Zmax.

Lohi Lake (LI)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1405	2107
2-4	3	1199	1799
4-6	5	975	1440
6-8	7	675	1010
8-10	9	395	595
10-12	11	175	260
12-14	13	90	135
14-16	15	45	68
16-Zmax.		30	45

Sample Protocol: Sample history treats the collection as a whole lake sample throughout the stratified period (1973 - 2003) “Sudbury Environmental Study” protocol.

Louck's Lake (S8)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	2260	4520	9040
2-4	3	1181	2362	4724
4-6	5	483	966	1932
6-8	7	77	154	308

Sample Protocol (1990-1998) (1a) epilimnion 0 - 4 m, metalimnion 4 - 6 m, hypolimnion 6 - Zmax.

Lousia Lake (LA)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	467	934
2-4	3	416	832
4-6	5	371	742
6-8	7	325	650
8-10	9	285	570
10-12	11	252	504
12-16	14	433	866
16-20	18	352	704
20-25	22.5	331	662
25-30	27.5	227	454
30-35	32.5	164	328
35-40	37.5	131	262
40-45	42.5	100	200
45-50	47.5	75	150
50-55	52.5	49	98
55-60	57.5	22	44

Sample Protocol (1990-1998) (4b) epilimnion 0 - 10 m, metalimnion 10 - 16 m, hypolimnion 16 - Zmax.

Maggie Lake (S7)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	726	1451
2-4	3	645	1290
4-6	5	561	1121
6-8	7	476	953
8-10	9	388	775
10-12	11	314	628
12-14	13	253	505
14-16	15	193	385
16-18	17	148	295
18-20	19	112	225
20-22	21	83	165
22-24	23	58	116
24-26	25	30	60
26-28	27	12	24
28-30	29	3	6
30-31		0.1	0.2

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

McKay Lake (MY)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	2094	1047
2-4	3	1620	810
4-6	5	942	471
6-8	7	492	246
8-10	9	306	153
10-12	11	218	109
12-14	13	150	75
14-16	15	102	51
16-18	17	60	30
18-19.5		12	6

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Middle Lake (ME)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1425	1780
2-4	3	1175	1470
4-6	5	895	1120
6-8	7	635	795
8-10	9	410	510
10-12	11	280	350
12-Zmax.		170	210

Sample Protocol: Sample history treats the collection as a whole lake sample throughout the stratified period (1973 - 2003) "Sudbury Environmental Study" protocol.

Moot Lake (MO)

Depth (m)	Sample Depth	Volume (ml)	
0-1	0.5	1020	1530
1-2	1.5	765	1148
2-3	2.5	513	770
3-4	3.5	339	509
4-5	4.5	210	315
5-6	5.5	113	170
6-7	6.5	42	63
7-Zmax.		5	8

Sample Protocol (1990-1998) (1b) epilimnion 0 - 4 m, metalimnion 4 - 5 m, hypolimnion 5 - Zmax.

Mountaintop Lake (MT)

Depth (m)	Sample Depth	Volume (ml)
0-1	0.5	1150
1-3	2	1700
3-5	4	1050
5-7	6	700
7-9	8	350
9.5		50

Phytoplankton and Chlorophyll Samples

Secchi <0.5m		Secchi 0.5-1.5m	Secchi 1.5-2.5m	Secchi 2.5-3.5m	Secchi >3.5m
<0.5	5000	1995	1460	1240	1150
2.0		3005	2200	1865	1735
4.0			1340	1135	1055
5.0				760	705
6.0					355
8.0					

Chemical Sample Protocol (1990-1998) (2) epilimnion 0 - 6m, metalimnion 6 - 8 m, hypolimnion 8 - Zmax.

Mouse Lake (MM)

Depth (m)	Sample Depth	Volume (ml)	
0-1	0.5	785	588
1-2	1.5	717	537
2-3	2.5	654	489
3-4	3.5	595	447
4-5	4.5	513	384
5-6	5.5	366	276
6-7	6.5	219	165
7-8	7.5	122	93
8-9	8.5	28	21

Sample Protocol (1990-1998) (1b) epilimnion 0 - 4 m, metalimnion 4 - 5 m, hypolimnion 5 - Zmax.

Nelson Lake Station #1

Chemical Samples

Depth (m)	Volume (ml)		Depth (m)	Volume (ml)	
0-2	775	970	18-20	165	210
2-4	655	820	20-24	250	320
4-6	580	720	24-28	155	190
6-8	510	640	28-32	110	140
8-10	440	550	32-36	75	90
10-12	375	470	36-40	50	60
12-14	315	390	40-44	40	50
14-16	260	320	44-48	25	30
16-18	205	260	1.0m<Zmax.	5	7

Phytoplankton and Chlorophyll Samples

Secchi (m)	Depth (m)	Volume (ml)	Secchi (m)	Depth (m)	Volume (ml)
4 - 5	0-2	1310	7 - 8	0-2	990
	2-4	1105		2-4	840
	4-6	980		4-6	740
	6-8	860		6-8	650
	8-10	745		8-10	565
				10-12	480
5 - 6	0-2	1160		12-14	400
	2-4	980		14-16	330
	4-6	870			
	6-8	765	8 - 9	0-2	940
	8-10	660		2-4	795
	10-12	560		4-6	705
				6-8	620
6 - 7	0-2	1060		8-10	535
	2-4	900		10-12	455
	4-6	795		12-14	380
	6-8	700		14-16	315
	8-10	605		16-18	250
	10-12	515			
	12-14	430	9 - 10	0-2	905
				2-4	765
				4-6	675
				6-8	595
				8-10	515
				10-12	440
				12-14	365
				14-16	300
				16-18	240
				18-20	195

Sample Protocol: Sample history treats the collection as a whole lake sample throughout the stratafied period (1973 - 2003) “Sudbury Environmental Study” protocol.

Nelson Lake Station #4

Chemical Samples

Depth (m)	Volume (ml)	Depth (m)	Volume (ml)
0-2	800	18-20	170
2-4	680	20-24	260
4-6	600	24-28	160
6-8	530	1.0m <Zmax.	110
8-10	460		
10-12	390		
12-14	320		
14-16	260		
16-18	210		

Phytoplankton and Chlorophyll Samples

Secchi (m)	Depth (m)	Volume (ml)	Secchi (m)	Depth (m)	Volume (ml)
4 - 5	0-2	650	7 - 8	0-2	990
	2-4	550		2-4	840
	4-6	490		4-6	740
	6-8	430		6-8	660
	8-10	370		8-10	570
				10-12	480
5 - 6	0-2	580		12-14	400
	2-4	490		14-16	320
	4-6	440			
	6-8	380	8 - 9	0-2	940
	8-10	330		2-4	800
	10-12	280		4-6	700
				6-8	620
6 - 7	0-2	1060		8-10	540
	2-4	900		10-12	460
	4-6	790		12-14	380
	6-8	700		14-16	300
	8-10	610		16-18	250
	10-12	520			
	12-14	420	9 - 10	0-2	900
				2-4	770
				4-6	680
				6-8	600
				8-10	520
				10-12	440
				12-14	360
				14-16	290
				16-18	240
				18-20	190

Sample Protocol: Sample history treats the collection as a whole lake sample throughout the stratafied period (1973 - 2003) “Sudbury Environmental Study” protocol.

Nunikani Lake (NI)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	898	1796
2-4	3	708	1416
4-6	5	553	1106
6-8	7	458	916
8-10	9	402	804
10-12	11	325	650
12-14	13	246	492
14-16	15	175	325
16-18	17	103	206
18-20	19	56	112
20-22	21	30	60
22-24	23	6	12

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Pearceley Lake (S15)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1542	3084	1157
2-4	3	1181	2362	886
4-6	5	852	1704	639
6-8	7	425	850	319

Sample Protocol (1990-1998) (1a) epilimnion 0 - 4 m, metalimnion 4 - 6 m, hypolimnion 6 - Zmax.

Peninsula Lake (Pen)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	575	1150
2-4	3	511	1022
4-6	5	450	900
6-8	7	394	788
8-10	9	343	686
10-12	11	295	590
12-14	13	255	510
14-16	15	224	448
16-18	17	195	390
18-20	19	170	339
20-22	21	149	298
22-24	23	129	258
24-26	25	108	216
26-28	27	81	162
28-30	29	59	119
30-32	31	38	76
32-34	33	19	38
34-36	35	7	14

Pincher Lake (S9)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1168	2336	3504
2-4	3	943	1886	2829
4-6	5	713	1426	2139
6-8	7	489	978	1467
8-10	9	316	632	948
10-12	11	218	436	654
12-14	13	128	256	384
14-15.5		25	50	75

Sample Protocol (1990-1998) (3) epilimnion 0 - 8 m, metalimnion 8 - 10 m, hypolimnion 10 - Zmax.

Plastic Lake (PC) (371 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	475	950	1900
2-4	3	417	834	1668
4-6	5	346	693	1386
6-8	7	276	553	1106
8-10	9	207	414	818
10-12	11	149	300	600
12-14	13	97	194	388
14-16	15	35	70	140

Sample Protocol (1990-1998) (3) epilimnion 0 - 8 m, metalimnion 8 - 10 m, hypolimnion 10 - Zmax.

Poker (East) Lake (PRE)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	2650	1325
2-4	3	2190	1095
4-6	5	1650	825
6-8	7	1200	600
8-10	9	850	425
10-12	11	580	290
12-14	13	400	200
14-16	15	260	130
16-18	17	160	80
18-20	19	70	35

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Poker West Lake (PR)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	2930	1465
2-4	3	2320	1160
4-6	5	1770	885
6-8	7	1340	670
8-10	9	880	440
10-12	11	420	210
12-14	13	220	110
14-16	15	98	49
16-17.5		29	15

Sample Protocol (1990-1998) (3) epilimnion 0 - 8 m, metalimnion 8 - 10 m, hypolimnion 10 - Zmax.

Ranger Lake (RM)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1318	989
2-4	3	1125	843
4-6	5	797	598
6-8	7	425	318
8-10	9	215	161
10-12	11	105	79
12.5		15	11

Sample Protocol (1990-1998) (3) epilimnion 0 - 8 m, metalimnion 8 - 10 m, hypolimnion 10 - Zmax.

Red Chalk East Lake (RCE) (351 for phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1163	582	2326
2-4	3	863	432	1726
4-6	5	686	343	1372
6-8	7	517	259	1034
8-10	9	350	175	700
10-12	11	199	100	398
12-14	13	108	54	216
14-16	15	67	34	134
16-18	17	40	20	80
18-19		5	2	9

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Red Chalk Main Lake (RCM) (11 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	914	457	229
2-4	3	844	422	211
4-6	5	792	396	198
6-8	7	738	369	185
8-10	9	684	342	171
10-12	11	630	315	158
12-14	13	582	291	146
14-16	15	534	267	134
16-18	17	484	242	121
18-20	19	428	214	107
20-22	21	376	188	94
22-24	23	326	163	82
24-26	25	250	125	63
26-28	27	164	82	41
28-30	29	108	54	27
30-32	31	78	39	20
32-34	33	46	23	12
34-36	35	16	8	4
36-38	37	16	8	4

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Red Pine Lake (RP)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	720	1439
2-4	3	587	1175
4-6	5	483	966
6-8	7	402	804
8-10	9	333	666
10-12	11	271	542
12-14	13	226	452
14-16	15	196	391
16-18	17	169	337
18-20	19	144	289
20-22	21	123	246
22-24	23	103	206
24-26	25	82	164
26-28	27	61	121
28-30	29	42	84
30-32	31	28	56
32-34	33	19	38
34-36	35	12	24
36-38	37	4	8

Ridout Lake (RT)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	784	1045
2-4	3	558	744
4-6	5	463	618
6-8	7	338	450
8-10	9	284	379
10-12	11	240	321
12-14	13	142	189
14-16	15	104	138
16-18	17	66	88
18-20	19	21	28
20.4			

Round Lake (S10)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1580	3162	6320
2-4	3	1147	2294	4588
4-6	5	728	1457	2912
6-8	7	391	783	1564
8-10	9	153	305	612

Sample Protocol: (1990-1998) Usually a 9.0m Zmax. and a whole lake sample.

Sherborne Lake (SH)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	769	1538
2-4	3	630	1240
4-6	5	517	1034
6-8	7	396	792
8-10	9	360	720
10-14	12	536	1072
14-18	16	345	690
18-22	20	216	432
22-26	24	132	264
26-28	27	36	72
28-30	29	20	40
30-35	32.5	12	24

Sample Protocol (1990-1998) (4b) epilimnion 0 - 10 m, metalimnion 10 - 16 m, hypolimnion 16 - Zmax.

Shoelace Lake (S11)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	1515	3029
2-4	3	1066	2132
4-6	5	666	1332
6-8	7	414	827
8-10	9	263	525
10-12	11	73	146

Sample Protocol (1990-1998) (2) epilimnion 0 - 6 m, metalimnion 6 - 8 m, hypolimnion 8 - Zmax.

Skidway Lake (S12)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	2141	4282	12846
2-4	3	1410	2820	8460
4-6	5	377	754	2262
6-7.8	7	71	142	426

Sample Protocol (1990-1998) (1a) epilimnion 0 - 4 m, metalimnion 4 - 6 m, hypolimnion 6 - Zmax.

Smoke Lake (SM)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	464	928
2-4	3	418	836
4-6	5	387	774
6-8	7	357	714
8-10	9	321	642
10-12	11	285	570
12-16	14	495	990
16-20	18	403	806
20-25	22.5	370	540
25-30	27.5	249	495
30-35	32.5	147	294
35-40	37.5	68	136
40-45	42.5	26	52
45-50	47.5	8	16
50-55	52.5	2	4

Sample Protocol (1990-1998) (4b) epilimnion 0 - 10 m, metalimnion 10 - 16 m, hypolimnion 16 - Zmax.

Solitaire Lake (SE) (131 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1082	541	271
2-4	3	912	456	228
4-6	5	832	416	208
6-8	7	766	383	192
8-10	9	692	346	173
10-12	11	620	310	155
12-14	13	560	280	140
14-16	15	508	254	127
16-18	17	452	226	113
18-20	19	400	200	100
20-22	21	352	176	88
22-24	23	304	152	76
24-26	25	250	125	63
26-28	27	172	86	43
28-30	29	76	38	19
30-31		6	3	2

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Sunset Lake (S13)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	2931	1465
2-4	3	829	414
4-6	5	242	121

Sample Protocol: (1990-1998) Usually a 6.5m Zmax. and a whole lake sample.

Swan Lake (SW)

Chemistry

Depth (m)	Sample Depth	Volume (ml)
0-2	1	1430
2-4	3	685
4-6	5	265
6-8.8	7	120

Phytoplankton and Chlorophyll Samples

Secchi 2.0m		Secchi 2 - 3m	
Depth (m)	Volume (ml)	Depth (m)	Volume (ml)
0-1.5	940	0-2	1500
1.5-2.5	750	2-4	720
2.5-3.5	520	4-6	280
3.5-4.5	290	Secchi > 3m use Chemistry Volumes	

Sample Protocol (1990-1998) (1a) epilimnion 0 - 4 m, metalimnion 4 - 6 m, hypolimnion 6 - Zmax.

Timberwolf Lake (TF)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	745	1490
2-4	3	620	1240
4-6	5	493	986
6-8	7	380	760
8-10	9	288	576
10-12	11	207	414
12-14	13	140	280
14-16	15	78	156
16-18	17	36	72
18-20	19	13	26

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Vernon Lake (H4)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	730	1460
2-4	3	595	1190
4-6	5	504	1009
6-8	7	422	843
8-10	9	340	679
10-12	11	268	536
12-14	13	219	438
14-16	15	194	388
16-18	17	168	335
18-20	19	142	283
20-22	21	117	234
22-24	23	100	200
24-26	25	80	160
26-28	27	56	112
28-30	29	39	78
30-32	31	23	46
32-33.5		5	10

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Walker Lake (WR) (251 for Phytoplankton)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	2394	1197	589
2-4	3	1996	998	499
4-6	5	1532	766	383
6-8	7	1010	505	253
8-10	9	578	289	145
10-12	11	312	156	78
12-14	13	136	68	34
14-17	15	28	14	7

Sample Protocol (1990-1998) (3) epilimnion 0 - 8 m, metalimnion 8 - 10 m, hypolimnion 10 - Zmax.

Westward Lake (WD)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	375	750
2-4	3	350	700
4-6	5	334	668
6-8	7	317	634
8-10	9	296	592
10-12	11	267	534
12-16	14	460	920
16-20	18	399	798
20-25	22.5	426	852
25-30	27.5	336	672
30-35	32.5	246	492
35-40	37.5	156	312
40-45	42.5	38	76

Sample Protocol (1990-1998) (4b) epilimnion 0 - 10 m, metalimnion 10 - 16 m, hypolimnion 16 - Zmax.

Windfall Lake (S14)

Depth (m)	Sample Depth	Volume (ml)		
0-2	1	1625	3250	1219
2-4	3	1161	2322	870
4-6	5	556	1112	417
6-8	7	333	666	250
8-10	9	208	416	156
10-12	11	96	192	72
12-13.8	12.5	22	44	17

Sample Protocol (1990-1998) (2) epilimnion 0 - 6 m, metalimnion 6 - 8 m, hypolimnion 8 - Zmax.

Young Lake (YG)

Depth (m)	Sample Depth	Volume (ml)	
0-2	1	642	1285
2-4	3	596	1191
4-6	5	542	1085
6-8	7	473	946
8-10	9	410	821
10-12	11	356	712
12-14	13	308	616
14-16	15	264	528
16-18	17	214	428
18-20	19	148	297
20-21		45	90

Sample Protocol (1990-1998) (4a) epilimnion 0 - 10 m, metalimnion 10 - 14 m, hypolimnion 14 - Zmax.

Appendix 4

Summary of MOE DESC zooplankton ID codes and species names and nomenclature changes (1980 - 2006)

Presented as Revision to the Z_Nomenclature Table and the complete Z_TAXA table of the EMRB_Zoodb 2006

Revisions to the Z_Nomenclature table

Order Anomopoda, Family Bosminidae

Bosmina (Bosmina) longirostris s.l. Muller 1785

B. LONGIR Bosmina longirostris s.l. Muller 1785 (Report DR83/9 Hitchin & Yan 1983)
Initial Species_ID 110 BOS LONG Bosmina longirostris (Pawson & Yan 1993) p 25
Species_ID 110 BOS LONG Bosmina longirostris (Allen Yan & Geiling 1993) p 15
Species_ID 110 BOS LONG Bosmina longirostris (Pawson & Yan 1997) p 28
Species_ID 110 BOS SPP Bosmina freyi liederi or longispina (EMRB2004 in 1974-2001)& longirostris in Zebra2M
Present Species_ID 150 E (E) LONG Eubosmina (Eubosmina) longispina Taylor et al 2002
Species_ID 110 BOS SPP Bosmina freyi liederii & longirostris EMRB_db
Present Species_ID 188 B (B) LONG Bosmina (Bosmina) longirostris (De Melo & Hebert 1994) p 1819
Note: Species_ID 188 only North American record in Hume Lake, California (De Melo & Hebert 1994) p 1819
Note2: Korinek et al. 1997 p 20 & 22 disputes the latter statement of De Melo & Hebert as "invalid"
Recommendation: Species_ID 188 should remain in the EMRB_Zoodb and associated specimens be checked for B freyi and/or B liederi assignment.

Bosmina (Bosmina) freyi sp. Nov. De Melo & Hebert, 1994
Initial Species_ID 110 BOS SP Bosmina longirostris (Allen, Yan & Geiling 1993) p 15 (Pawson & Yan 1993p25
Species_ID 110 BOS SP Bosmina longirostris, freyi & liederi EMRB_db 8/20/1998
Species_ID 189 B (S) FREY Bosmina (Sinobosmina) freyi sp. Nov. (De Melo & Hebert 1994) p 1821
Present Species_ID 189 B (B) FREY Bosmina (Bosmina) freyi (Taylor et al. 2002) p 1493.

Bosmina (Bosmina) liederi sp. Nov. De Melo & Hebert, 1994
Initial Species_ID 110 BOS SP Bosmina longirostris (Allen, Yan & Geiling 1993) p 15 (Pawson & Yan 1993p25
Species_ID 110 BOS SP Bosmina longirostris, freyi & liederi EMRB_db 8/20/1998
Species_ID 190 B (S) LIED Bosmina (Sinobosmina) liederi sp. Nov. (De Melo & Hebert 1994) p 1821
Present Species_ID 190 B (B) LEID Bosmina (Bosmina) liederi (Taylor et al. 2002) p 1493.

Bosmina (Bosmina) spp Taylor et al. 2002
Initial Species_ID 164 BOS SP Bosmina sp (Pawson & Yan 1997) p 29
Present Species_ID 640 B (B) SP Bosmia (Bosmina) sp Baird, 1845 emend Taylor et al 2002

Eubosmina (Eubosmina) striata s. l. Leydig 1869 emend Taylor et al 2002

EUB LONG Eubosmina lonispina Leydig 1860 (Report DR83/9 Hitchin & Yan 1983)
Initial SpeciesID 150 EUB LONG Eubosmina lonispina (Pawson & Yan 1993 p 26, 1997 p 29
B (EUB) LONG Bosmina (Eubosmina) longispina (De Melo & Hebert 1994) p 1812
Species_ID 150 E (E) LONG Eubosmina (Eubosmina) longispina (Taylor et al 2002) p 1493
Species_ID 150 E (E) LONG Eubosmina (Eubomina) longispina in EMRB_Zoodb 2004 (1976 - 2003)
Present Species_ID 150 E (E) striata Eubosmina (Eubosmina) striata Herrick, 1882 emend Haney & Taylor 2003 p 880

Eubosmina (Eubomina) coregoni Baird, 1857

EUB CORE Eubosmina coregoni Baird, 1857 (Report DR83/9 Hitchin & Yan 1983

Initial Species_ID 132 EU COR Eubosmina coregoni Baird, 1857 (Pawson & Yan 1997) p 28

Species_ID 132 B (E) COR Bosmina (Eubosmina) coregoni Baird, 1857 (De Melo & Hebert 1994) p 1811

Species_ID 132 E (E) COR Eubosmina (Eubosmina) coregoni Baird, 1857(Taylor et al 2002) p 1493

Present Species_ID 132 E (E) COR Eubosmina (Eubosmina) coregoni coregoni Baird 1857 in Haney & Tayloor 2003 p 875 to subspecies on North American continent.

Eubosmina (Eubomina) maritima P E Muller, 1868 emend Taylor et al 2002

Initail pecies_ID 194 EUB MAR Eubomina maritima P E Muller, 1868 (DESC EMRB_Zoodb)

Species_ID 194 B EUB MAR Bosmina Eubomina maritima (De Melo & Hebert 1994) p 1811

Present Species_ID 194 E (E) MAR Eubosmina (Eubomina) maritima emend Taylor et al. 2002 p 1492

Eubosmina sp

Initial Species_ID 171 & 156 EUB SP Eubosmina sp (Pawson & Yan 1993

Present Species_ID 156 EUB SP Eubosmina sp (DESC EMRB_zoodb June 3, 2001)

Realized duplicate record in Pawson & Yan 1993

Eubosmina (Eubosmina) spp Seligo, 1900 emend Taylor et al 2002

Initial Species_ID 156 EUB SP Eubosmina sp (Pawson & Yan 1997) p 29

Species_ID 156 B (EUB) SP Bosmina (Eubosmina) sp (De Melo & Hebert 1994) p 1812

Present Species_ID 156 E (E) SP Eubosmina (Eubosmina) sp (Taylor et al 2003) p 1492

Eubosmina (Neobosmina) sp. Lieder, 1957, emend Taylor et al 2002

Initial Species_ID 15 EUB SP Eubosmina sp (Pawson & Yan 1997) p 29

Present Species_ID 195 E (N) SP Eubosmina (Neobosmina) sp (Taylor et al 2002) p 1492

Eubosmina (Neobosmina) tubicen Brehm 1953 emend Taylor et al 2002

EU TUBI Eubosmina tubicen Brehm 1953 (Report DR83/9 Hitchin & Yan 1983)

Initial Species_ID 133 EUB TUB Eubosmina tubicen (Pwson & Yan 1997) p 28

Present Species_ID 133 E (N) TUB Eubosminna (Neobosmina) tubicen emend Taylor et al 2002 p 1492

Eubosmina (Neobosmina) huaronensis Delachaux 1918 emend Taylor et al 2002

Initial Species_ID 191 EUB HAUR Eubosmina huaronensis (DESC EMRB_Zoodb)

Present Species_ID 191 E (N) HAUR Eubosmina (Neobosmina) huaronensis (Taylor et al 2002) p 1492

Eubosmina (Lunobosmina) oriens sp nov De Melo & Hebert 1994

Initial Species_ID 193 EUB ORI Eubosmina oriens sp nov De Melo & Hebert 1994 p 1815

Present Species_ID 193 E (L) ORI Eubosmina (Lunobosmina) oriens emend Taylor et al 2002 p 1492

Eubosmna (Lunobosmina) sp Taylor et al 2002

Initial Species_ID 156 EUB SP Eubosmina sp (Pawson & Yan 1997) p 29

Present Species_ID 654 E (L) SP Eubosmina (Lunobosmina) sp emend Taylor et al 2002 p 1492

Family Chydoridae

Chydorus bicornutus Doolittle, 1909
CH CICOR Chydorus bicornutus Doolittle, 1909 (Report DR83/9 Hitchin & Yan 1983
Initial/ Present Species_ID 116 CHY BIC Chydorus bicornutus Doolittle, 1909 (Pawson & Yan 1997) p 28

Chydorus sphaericus O.M. Muller, 1785
CH SPHAE Chydorus sphaericus O.M. Muller, 1785 (Report DR83/9 Hitchin & Yan 1983
Initial/ Present Species_ID 118 CHY BIC Chydorus sphaericus O.M. Muller, 1785 (Pawson & Yan 1997) p 28

Pseudochydorus globosus (Baird, 1843)
Initial Specie_ID 153 CHY GLOB Chydorus globosus (Baird, 1843) (Pawson & Yan 1997) p 29
Present Species_ID 153 CHY GLOB Pseuchydorus globosus (Baird, 1843) in Smirnov 1996 p 178

Disparalona hamata (Birge, 1879)
Initial Species_ID 141 PLE HAMU Pleuroxus hamulatus Birge 1910 (Pawson & Yan 1997) p 29
Present Species_ID 141 DISP HAMA Disparalona hamata (Birge, 1879) in Smirnov 1996 p 81

Disparalona acutirostris (Fryer, 1971
Initial Species_ID 155 AL ACUT Alonella acutirostris (Birge, 1879) (Pawson & Yan 1997) p 29
Present Species_ID 155 DISP ACUT Disparalona acutirostris (Fryer, 1971 in Smirnov 1996 p 83

Disparalona sp (Fryer, 1968)
Initial/Present Species_ID 171 DISP SP Disparalona sp (Fryer, 1968) in Smirnov 1996 p 75

Graptoleberis testudinaria (Fischer, 1851)
Initial/Present Species_ID 196 GRAP TES Graptoleberis testudinaria (Fischer, 1851) EMRB_db June 3 2001
Formerly spp_id 196 was a duplicate record as Macrothrix laticornis (MACR LATI)

Camptocercus rectirostris (Schoedler, 1862)
Initial/Present Species_ID 706 C RECT Camptocercus rectirostris (Schoedler, 1862)

Eurycercus (Bullatifrons) longirostris (Hann, 1982)
Initial Species_ID 13EUR LAM Euycercus lamellatus (O.F. Muller, 1785) (Pawson & Yan 1993) p 25
EUR LAM Euycercus lamellatus (O.F. Muller, 1785) (Pawson & Yan 1997) p 28
EUR (B) SP Eurycercus (Bullatifrons) sp. (Hann, 1980) in Hann, 1981
Present Species_ID 134 EUR (B) LONG Eurycercus (Bullatifrons) longirostris emend (Hann, 1982)
Note: Hann, 1984 distinguishes reprodutivity and geographic isolating E (B) LONG with NE latitudes.

Family Macrothrixidae

Macrothrix laticornis Jurine, 1820
Initial Species_ID 139 & 196 MAC LAT & MACR LATI repectively in Pawson & Yan 1993 as 139 & duplicate record in EMRB_Zoodb June 3, 2001
Present Species_ID 139 MAC LAT Macrothrix laticornis Jurine, 1820

Family Mysidae

Mysis oculata relicta Loven
Initial Species_ID 637 MYSIS Mysis relicta Loven in EMRB_Zoodb 2003
Present Species_ID 637 MYSIS Mysis oculata relicta Loven in Pennak, 1978 p 436

Family Daphniidae

Ceridaphnia pulchella Sars, 1862
CE PULCH Ceriodaphnia pulchella Sars, 1862 (Report DR83/9 Hitchin & Yan 1983)
Initial/Present Species_ID 113 CER PUL Ceriodaphnia pulchella Sars, 1862 (Pawson & Yan 1997) p 28

Ceriodaphnia lacustris Birge, 1893
CE LACUS Ceriodaphnia lacustris Birge, 1893 (Report DR83/9 Hitchin & Yan 1983)
Initial.Present Species_ID 111 CER LAC Ceriodaphnia lacustris Birge, 1893 (Pawson & Yan 1997) p 28

Daphnia sp O.F. Muller, 1785
Initial / Present Species_ID 168 DAP SP Daphnia sp O.F. Muller, 1785 (Pawson & Yan 1993) p 26

Daphnia (Daphnia) sp O.F. Muller, 1785
Initial / Present Species_ID 710 DAP DAP Daphnia (Daphnia) sp O.F. Muller, 1785 in Brooks, 1957

Daphnia (Ctenodaphnia) spp Dybowski & Grochowski, 1895
Initial / Present Species_ID 660 DAP CTEN Daphnia (Ctenodaphnia) spp Dybowski & Grochowski, 1895 in Brooks, 1957

Daphnia (Ctenodaphnia) magma Straus, 1820
Initial / Present Species_ID 659 DAP MAG Daphnia (Ctenodaphnia) magna Straus, 1820 in Brooks, 1957

Daphnia (Hyalodaphnia) spp
Initial / Present Species_ID 711 DAP HYA Daphnia (Hyalodaphnia) sp

Daphnia (Daphnia) ambigua Scourfield, 1947 emend Colbourne & Hebert, 1996
Initial Species_ID 119 DAP AMB Daphnia ambigua Scourfield, 1947 (Pawson & Yan 1997) p 28
Present Species_ID 119 DAP AMB Daphnia (Daphnia) ambigua emend Colbourne & Hebert, 1996 p 355
Note: see Hebert, Witt & Adamowicz 2003 re:geographic distribution of 4 mtDNA clusters of D AMBa in N.A. p 264

Daphnia (Daphnia) catawba Coker, 1926 emend Colbourne & Hebert, 1996
DA CATAW Daphnia catawba Coker, 1926 (Report DR83/9 Hitchin & Yan 1983)
Initial Species_ID 120 DAP CAT Daphnia catawba Coker, 1926 (Pawson & Yan 1997) p 28
Present Species_ID 120 DAP CAT Daphnia (Daphnia) catawba emend Colbourne & Hebert, 1996 p 355
Note: see Hebert & Finston, 1997

Daphnia (Daphnia) pulicaria Forbes, 1893 emend (= pulicaria sensu Brandlova, 1972)

Initial Species_ID 120 DAP SCHO Daphnia schodleri Sars, 1862 (Pawson & Yan 1997) p 28 emend Brandlova 1972 in Hebert & Finston, 1997 (schodleri= pulicaria sensu)

Present Species_ID 124 DAP PUL Daphnia (Daphnia) pulicaria Forbes, 1893 emend Brandlova, 1972 in Hebert & Finston, 1997 p 1254 & Colbourne & Hebert, 1996 p 354.

Daphnia (Dapnia) parvula Fordyce, 1901 emend Colbourne & Hebert 1996

Initial Species_ID 125 DAP PARV Daphnia parvula Frodyce, 1901 (Pawson & Yan 1997) p 28

Present Species_ID 125 DAP PARV Daphnia (Daphnia) parvula emend Colbourne & Hebert, 1996 p 355

Daphnia (Daphnia) pulex Leydig, 1860 emend Colbourne & Hebert, 1996

DA PULEX Daphnia pulex Leydig, 1860 (Report DR83/9 Hitchin & Yan 1983)

Initial Species_ID 126 DAP DUL Daphnia pulex Leydig, 1860 (Pawson & Yan 1997) p 28

Present Species_ID 126 DAP PULX Daphnia (Daphnia) pulex emend Colbourne & Hebert, 1996 p 355

Daphnia (Daphnia) retrocurva Forbes, 1882 emend Colbourne & Hebert, 1996

DA RETRO Daphnia retrocurva Forbes, 1882 (Report DR83/9 Hitchin & Yan 1983)

Initial Species_ID 127 DAP RETR Daphnia retrocurva Forbes, 1882 (Pawson & Yan 1997) p 28

Present Species_ID 127 DAP RETR Daphnia (Daphnia) retrocurva emend Colbourne & Hebert, 1996 p 355

Daphnia (Hyalodaphnia) mendotae Birge, 1918 emend Taylor Hebert & Colbourne, 1996 p 503

D G MEN Daphnia galeata mendotae Birge, 1918 (Report DR83/9 Hitchin & Yan 1983)

Initial Species_ID 122 DAP G ME Daphnia galeata mendotae Birge, 1918 (Pawson & Yan 1997) p 28

Species_ID 122 DAP ME Daphnia mendotae Birge, 1918 emend Taylor, Hebert & Colbourne 1996 p 503

Present Species_ID 122 DAP ME Daphnia (Hyalodaphnia) mendotae emend Colbourne & Hebert 1996 p355

Daphnia (Hyalodaphnia) longiremis Sars, 1861 emend Colbourne & Hebert, 1996 p 355

DA LONG Daphnia longiremis Sars, 1861 (Report DR83/9 Hitchin & Yan 1983)

Initial Species_ID 123 DAP LONG Daphnia longiremis Sars, 1861 (Pawson & Yan 1997) p 28

Present Species_ID 123 DAP LONG Daphnia (Hyalodaphnia) longiremis Sars, 1861 emend Colbourne & Hebert 1996 p 355

Daphnia (Hyalodaphnia) longispina (O.F. Muller, 1785)

Initial Species_ID 197 DAP LSPINA Daphnia longispina O.F. Muller, 1785 EMRB_Zoodb Apr 12, 2000

Present Species_ID 197 DAP LSPINA Daphnia (Hyalodaphnia) longispina O.F. Muller, 1785 emend Colbourne & Hebert , 1996 p 355

Daphnia (Hyalodaphnia) dentifera Forbes, 1893 emend Cobourne & Hebert, 1996 p 354 Fig. 4

Initial Species_ID 128 DAP ROS Daphnia rosea Sars, 1862, emend Richard, 1896 (Pawson & Yan 1997) p 28 emend Taylor, Hebert & Colbourne, 1996 p 503 (D rosea=Daphnia dentifera Forbes,1893)

Initial Species_ID 159 DAP DENTIF Daphnia dentifera Forbes, 1893 (DESC EMRB_Zoodb

Present Species_ID 159 DAP DENTIF Daphnia (Hyalodaphnia) dentifera Forbes, 1893 emend Colbourne & Hebert, 1996 p 355 Note: inclusive of Species_ID 128

Daphnia (Hyalodaphnia) dubia Herrick, 1895 emend Colbourne & Hebert, 1996 p 354 Fig 4
DA DUBIA Daphnia dubia Herrick, 1895 (Report DR83/9 Hitchin & Yan 1983)
Initial Species_ID 121 DAP DUB Daphnia dubia Herrick, 1895 (Pawson & Yan 1997) p 28
Present Species_ID 121 DAP DUB Daphnia (Hyalodaphnia) dubia Herrick, 1895 emend Colbourne & Hebert,
1996 p 354 Fig. 4

Daphnia (Daphnia) minnehaha Herrick, 1884
Initial Species_ID 223 DAP MIN Daphnia minnehaha Herrick, 1884
Present Species_ID 223 DAP MIN Daphnia (Daphnia) minnehaha Herrick, 1884 emend Hebert & Finston 1997 p 354 Fig 4

Order Ctenopoda Family Holopedidae

Holopedium gibberum sp. Zaddach, 1885
H GIBBER Holopedium gibberum Zaddach, 1885 Report DR83/9 Hitchin & Yan, 1983
Initial Species_ID 135 HOL GIBB Holopedium gibberum Zaddach, 1885 (Pawson & Yan 1997) p 28
Present Species_ID 135 HOL GIBB Holopedium gibberum Zaddach, 1885

Family Sididae
Diaphanosoma bergei Korinek, 1981
Initial Species_ID 130 DIA BRAC Diaphanosoma brachynurum (Lieven, 1848) (Pawson & Yan, 1997) p 29
DIA LEUC Diaphanosoma leuchtenbergianum (Fischer 1851) Report DR83/9 Hitchin & Yan 1983
Initial Species_ID 131 DIA LEU Diaphanosoma leuchtenbergianum (Fischer 1851) (Pawson & Yan1997)p 29
Present Species_ID 152 DIA BIRG Diaphanosoma bergei Korinek, 1981 inclusive of Species_ID 130 & 131

Order Onychopoda Family Cercopagidae

Bythotrephes longimanus Leydig, 1860 emend Berg & Garton, 1994, emend Therriault et al 2002 p 74
Initial Species_ID 149 BYT CEDE Bythotrephes cederstroemi Schoedler, 1877 (Pawson & Yan 1997) p 30
Note: BYT CEDE possesses a kink along the caudal process & is described as a variant 'form' of B. longimanus
Present Species_ID 158 BYT LONG Bythotrephes longimanus (Therriault et al 2002) p 74
Note: BYT LONG is distinguished by the absence of a caudal kink. The two 'forms' are variants of the same species.

Family Polyphemidae
Polyphemus pediculus Linne, 1761
P PEDIC Polyphemus pediculus Linne, 1761 Report DR83/9 Hitchin & Yan 1983
Initial / Present Species_ID 142 POL PED Polyphemus pediculus Linne, 1761 (Pawson & Yan 1997) p 28

Order Haplopoda Family Leptodoridae

Leptodora kindtii Focke, 1844
L KINDTI Leptodora kindtii Focke, 1844 Report DR83/9 Hitchin & Yan 1983
Initial / Present Species_ID 138 LEP KIN Leptodora kindtii Focke, 1844 (Pawson & Yan 1997) p 28

Order Cyclopoida Family Cyclopidae

Acanthocyclops vernalis Fischer, 1853

C VERNAL Cyclops vernalis Fischer, 1853 Report DR83/9 Hitchin & Yan 1983

Initial Species_ID 304 CYC VERN Cyclops vernalis Fischer, 1853 Pawson & Yan 1997 p 30

CYC VERN Acanthocyclops vernalis complex Fischer, 1853 emend Kiefer, 1978

Species Split

Initial / Present Species_ID 339 ACA ROB Acanthocyclops robustus (Sars, 1863 emend Hudson et al 1998)p8

Initial / Present Species_ID 346 ACA BREVI Acanthocyclops brevispinosus (Dodson, 1994 emend Hudson et al 1998) p 8

Tropocyclops prasinus mexicanus Kiefer, 1938

T P MEX Tropocyclops prasinus mexicanus Kiefer, 1938 Report DR83/9 Hitchin & Yan 1983

Initial Species_ID 312 T P MEX Tropocyclops prasinus mexicanus Kiefer, 1938 (Pawson & Yan 1997) p 30

Species_ID 338 TRO EXT Tropocyclops extensus (Kiefer, 1931) emend Dussart & Fernando, 1990

Present Species_ID 338 T P MEX Tropocyclops prasinus mexicanus (Kiefer, 1938) emend Hudson et al 1998

Eucyclops elegans Herrick, 1884

Initial Species_ID 307 EUC SPER Eucyclops speratus Lilljeborg, 1901 (Pawson & Yan 1997) p 30

Present Species_ID 347 EUC ELEG Eucyclops elegans Herrick, 1884 emend Hudson et al 1998 p 13

Note: "True E. speratus was not found in any North American collection" Hudson et al 1998 p 13

Eucyclops elegans Herrick, 1884

Initial Species_ID 334 EUC NEOM Eucyclops neomacruroides Dussart & Fernando, 1990

Present Species_ID 347 EUC ELEG Eucyclops elegans Herrick, 1884 emend Hudson et al 1998 p 13

Note: "Reid has examined the type of E. neomacruroides Dussart & Fernando, 1990 described from Ontario. It is indistinguishable from E. elegans" Hudson et al 1998, p 13

Eucyclops agilis Koch, 1838

E AGILIS Eucyclops agilis Koch, 1838 Report DR83/9 Hitchin & Yan 1983

Initial Species_ID 306 EUC AGIL Eucyclops agilis Koch, 1838 emend Balcer, Korda & Dodson, 1984 p 115

Initial Species_ID 333 EUC SERR Eucyclops serrulatus Fischer, 1851 emend Kiefer, 1978 (Pawson & Yan 1997p 31

Species_ID 333 EUC SERR Eucyclops serrulatus Fischer, 1851 emend Kiefer, 1978 emend Balcer, Korda & Dodson, 1984 p 115 E. serrulatus=E. agilis

Present Species_ID 306 EUC AGIL Eucyclops agilis Koch, 1838 emend Balcer, Korda & Dodson ,1984 p 115

Note1: "Eucyclops agilis (Koch) 1838 is occationally referred to as E. serrulatus (Tork 1976)" p 115 in Balcer, Korda & Dodson ,1984

Note2: "Eucyclops agilis (Koch)[=serrulatus (Fischer)]" reference C. Williamson 1991, Copepoda Chapter 21 in Thorp & Covich 1991

Mesocyclops edax S.A. Forbes, 1891

M EDAX Mesocyclops edax S.A. Forbes, 1891 Report DR83/9 Hitchin & Yan 1983

Initial / Present Species_ID 309 MES EDAX Mesocyclops edax S.A. Forbes, 1891 (Pawson & Yan 1997) p 30

Cyclops scutifer Sars, 1863

C SCUTIF Cyclops scutifer Sars, 1863 Report DR83/9 Hitchin & Yan 1983

Initial / Present Species_ID 303 CYC SCUT Cyclops scutifer Sars, 1863 (Pawson & Yan 1997) p 30

Diacyclops thomasi S.A. Forbes, 1882

C B THOM Cyclops bicuspidatus thomasi S.A. Forbes, 1882 Report DR83/9 Hitchin & Yan 1983

Initial Species_ID 302 C B THOM Cyclops bicuspidatus thomasi S.A. Forbes, 1882 (Pawson & Yan 1997) p 30

Species_ID 302 C B THOM Diacyclops bicuspidatus thomasi S.A. Forbes, 1882 emend Dussart, 1969

Present Species_ID 302 DIA THOM Diacyclops thomasi S.A. Forbes, 1882 emend Hudson et al 1998 p 12

Paracyclops poppei Rehberg, 1880

P F POP Paracyclops fimbriatus poppei Rehberg, 1880 Report DR83/9 Hitchin & Yan 1983

Initial Species_ID 311 P F POP Paracyclops fimbriatus poppei Rehberg, 1880

Species_ID 311 PARA POP Paracyclops poppei Rehberg, 1880 sp nov emend Frenzel 1977 in Hudson 1998

Ergalsilis sp. Nordmann, 1832

Initial Species_ID 305 ERG SP Ergalsilis sp. Nordmann, 1832 (Pawson & Yan 1993) p 28

Initial Species_ID 324 ERGA SP Ergalsilis sp. Nordmann, 1832 (Pawson & Yan 1993) p 28 duplicate name

Species_ID 305 ERG SP Ergalsilis sp. Nordmann, 1832 (Pawson & Yan 1997) p 30

Species_ID 324 ERGA SP Ergalsilis sp. Nordmann, 1832 (Pawson & Yan 1997) p 31 duplicate name

Present Species_ID 305 ERGASIL Ergalsilis sp. Nordmann, 1832 (DESC EMRB_zoodb)

Order Calanoida

Family Diaptomidae Pre 1990 Diaptomus sp. Identification data nomenclature changes

Published data example Hitchin & Yan 1983

Bench sheet Zebra2 pre 1990

Leptodiaptomus ashlandi Marsh, 1893 emend Light, 1938 emend Dussart & Defraye, 1995

Initial Species_ID 202 D ASHL Diaptomus ashlandi Marsh, 1893 pre 1990 data Hitchin & Yan 1983

Present Species_ID 202 LEPTO ASHL Leptodiaptomus ashlandi Marsh, 1893 emend Light, 1938 emend Dussart & Defraye, 1995

Leptodiaptomus minutus Lilljeborg, 1889 emend Light, 1938 emend Dussart & Defraye, 1995

Initial Species_ID 204 DI MINUT Diaptous minutus Lilljeborg, 1889 pre 1990 data Hitchin & Yan 1983

Present Species_ID 204 LETO MIN Leptodiaptous minutus Lilljeborg, 1889 emend Light, 1938, emend Dussart & Defraye, 1995

Leptodiaptomus sicilis S A Forbes, 1882 emend Light, 1938 emend Dussart & Defraye, 1995

Initial Species_ID 208 D SICILI Diaptomus sicilis S A Forbes, 1882 pre 1990 data Hitchin & Yan 1983

Present Species_ID 208 LEPTO SICI Leptodiaptomus sicilis S A Forbes, 1882 emend Light, 1938 emend Dussart & Defraye, 1995

Leptodiaptomus siciloides Lilljeborg, 1889 emend Light, 1938 emend Dussart & Defraye, 1995

Initial Species_ID 209 D SICILO Diaptomus siciloides Lilljeborg, 1889 pre 1990 data Hitchin & Yan 1983

Present Species_ID 209 LEP SICILO Leptodiaptomus siciloides Lilljeborg, 1889 emend Light, 1938 emend Dussart & Defraye, 1995

Leptodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995
Initial Species_ID 226 DIAPT SP Diaptomus sp. Light, 1938 pre 1990 data Hitchin & Yan 1983
Present Species_ID 226 LEPTO SP Leptodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995

Aglaodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995
Initial Species_ID 226 DIAPT SP Diaptomus sp. Light, 1938 pre 1990 data Hitchin & Yan 1983
Present Species_ID 225 AGLAO SP Aglaodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995

Skistodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995
Initial Species_ID 226 DIAPT SP Diaptomus sp. Light, 1938 pre 1990 data Hitchin & Yan 1983
Present Species_ID 234 SKISTO SP Skistodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995

Onychodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995
Initial Species_ID 226 DIAPT SP Diaptomus sp. Light, 1938 pre 1990 data Hitchin & Yan 1983
Present Species_ID 232 ONYCHO SP Onychodiaptomus sp. Light, 1938 emend Dussart & Defraye, 1995

Aglaodiaptomus leptopus S A Forbes, 1882 emend Dussart & Defraye, 1995 first reported 1987 EMRB_Zoodb
Initial Species_ID 203 DI LEPTO Diaptomus leptopus S A Forbes, 1882 in 1987 data Zebra2 benchsheets
Present Species_ID 203 AGLA LEPT Aglaodiaptomus leptopus S A Forbes, 1882 emend Dussart & Defraye, 1995

Skistodiaptomus oregonensis Lilljeborg, 1889 emend Dussart & Defraye, 1995
Initial Species_ID 205 DI OREGON Diaptomus oregonensis Lilljeborg, 1889, Hitchin & Yan 1983
Present Species_ID 205 SKISTO OREG Skistodiaptomus oregonensis Lilljeborg, 1889 emend Dussart & Defraye, 1995
Skistodiaptomus reighardi Marsh, 1895 emend Dussart & Defraye, 1995
Initial Species_ID 206 DI REIG Diaptomus reighardi Marsh, 1895 in Muskoka Lake 1989 only EMRB_Zoodb
Present Species_ID 206 SKISTO REIG Skistodiaptomus reighardi Marsh, 1895 emend Dussart & Defraye, 1995

Onychodiaptomus sanguineus Forbes 1876 emend Dussart & Defraye, 1995
Initial Species_ID 207 DI SANGDiaptomus sanguineus Forbes 1876 in 1983-84 data Zebra2 benchsheets
Present Species_ID 207 ONY SANG Onychodiaptomus sanguineus Forbes 1876 emend Dussart & Defraye, 1995

<u>Order Rotifera</u>
Aspanchnopus multiceps Schrank, 1793
Initial Species_ID 509 ASP MULT Aspanchnopsis multiceps Schrank, 1793 (Pawson & Yan 1993) p 29
Initial Species_ID 509 ASP MULT Aspanchnopsis multiceps Schrank, 1793 (Pawson & Yan 1997) p 31
Present Species_ID 509 ASP MULT Aspanchnopus multiceps Schrank, 1793 (Pennak 1978
Note:spelling correction Aspanchnopus EMRB_Zoodb Nov 29 2000)

Aspanchnopus sp De Guerne, 1888
Initial Species_ID 510 AS_OPSIS Aspanchnopsis sp De Guerne, 1888 (Pawson & Yan 1993) p 29
Initial Species_ID 510 AS_OPSIS Aspanchnopsis sp De Guerne, 1888 (Pawson & Yan 1997) p 31
Present Species_ID 510 ASP_OPUS Aspanchnopus sp De Guerne, 1888 (Pennak 1978EMRB_Zoodb Nov 29 Note:spelling correction Aspanchnopus 2000)

Asplanchna herricki De Guerne, 1888
Initial Species_ID 506 ASP HERR Asplanchna herrickii De Guerne, 1888 (EMRB_Zoodb 1999
Present Species_ID 506 ASP HERR Asplanchna herricki De Guerne, 1888 (EMRB_Zoodb Nov 29 2000
Note:spelling correction herricki

Branchionus havanaensis Rousselet, 1911
Initial Species_ID 513 BRA HAVA Branchionus havaniensis Rousselet, 1911 (Pawson & Yan 1993) p 29
Species_ID 513 BRA HAVA Branchionus havaniensis Rousselet, 1911 (Pawson & Yan 1997) p 31
Present Species_ID 513 BRA HAVA Branchionus havanaensis Rousselet, 1911 EMRB_Zoodb Nov 29 2000
Note:spelling correction havanaensis

Ploesoma triacanthum Bergendal, 1892
Initial Species_ID 571 PLOE TRI Ploesoma tricanthum Bergendal, 1892 (Pawson & Yan 1993) p 29
PLOE TRI Ploesoma tricanthum Bergendal, 1892 (Pawson & Yan 1997) p 33
Present Species_ID 571 PLOE TRI Ploesoma triacanthum Bergendal, 1892 EMRB_Zoodb Nov 29 2000
Note:spelling correction triacanthum

Trichocera rousseleti Voigt, 1901
Initial Species_ID 593 TRIC ROU Trichocera rouselleti Voigt, 1901 (EMRB_Zoodb 1999)
Present Species_ID 593 TRIC ROU Trichocera rousseleti Voigt, 1901 EMRB_Zoodb Nov 29 2000
Note:spelling correction rousseleti

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus.

Code	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR / CITATION
135	HOL GLAC	HOLOPEDIUM GIBBERUM	ZADDACH, 1855
173	HOL SP	HOLOPEDIUM SP.	ZADDACH, 1855
145	SID CRYS	SIDA CRYSTALLINA	O.F. MULLER, 1776
185	SIDA SP	SIDA SP.	STRAUS, 1820
137	LAT SET	LATONA SETIFERA	O.F. MULLER, 1785
176	LATON SP	LATONA SP.	STRAUS, 1820
130	DIA BRAC	DIAPHANOSOMA BRACHYURUM (DISCONTINUED)	LIEVEN, 1848 DISCONTINUED NOW DIA BIRG
131	DIA LEU	DIAPHANOSOMA LEUCHTENBERGIANUM	FISCHER, 1850 DISCONTINUED NOW DIA BIRG
152	DIA BIRG	DIAPHANOSOMA BIRGEI	KORINEK, 1981
169	DIA SP	DIAPHANOSOMA SP.	FISCHER, 1850
119	DAP AMB	DAPHNIA (DAPHNIA) AMBIGUA	SCOURFIELD, 1947 EMEND. COLBOURNE & HEBERT, 1996
120	DAP CAT	DAPHNIA (DAPHNIA) CATAWBA	COKER, 1926 EMEND. COLBOURNE & HEBERT, 1996
124	DAP PUL	DAPHNIA (DAPHNIA) PULICARIA	FORBES, 1893 EMEND. COLBOURNE & HEBERT, 1996
125	DAP PARV	DAPHNIA (DAPHNIA) PARVULA	FORDYCE, 1901 EMEND. COLBOURNE & HEBERT, 1996
126	DAP PULX	DAPHNIA (DAPHNIA) PULEX	LEYDIG, 1860, RICHARD, 1896 EMEND. COLBOURNE & HEBERT, 1996
129	DAP SCHO	DAPHNIA (DAPHNIA) SCHODLERI (DISCONTINUED)	SARS, 1862 HEBERT & FINSTON 1997 DISCONTINUED NOW PULICARIA
127	DAP RETR	DAPHNIA (DAPHNIA) RETROCURVA	FORBES, 1882 EMEND. COLBOURNE & HEBERT, 1996
187	DAP MIDD	DAPHNIA (DAPHNIA) MIDDENDORFFIANA	FISCHER, 1851 EMEND. COLBOURNE & HEBERT, 1996
223	DAP MIN	DAPHNIA (DAPHNIA) MINNEHAHA	HERRICK, 1884 HEBERT & FINSTON 1997
121	DAP DUB	DAPHNIA (HYALODAPHNIA) DUBIA	HERRICK, 1895, EMEND. COLBOURNE & HEBERT, 1996
122	DAP ME	DAPHNIA (HYALODAPHNIA) MENDOTAE	BIRGE, 1918 EMEND. COLBOURNE & HEBERT, 1996
123	DAP LONG	DAPHNIA (HYALODAPHNIA) LONGIREMIS	SARS, 1861 EMEND. COLBOURNE & HEBERT, 1996
128	DAP ROS	DAPHNIA (HYALODAPHNIA) ROSEA (DISCONTINUED)	SARS, 1862 RICHARD, 1896 TAYLOR, HEBERT & COLBOURNE 1996 DISCONTINUED NOW DENTIFERA
159	DAP DENTIF	DAPHNIA (HYALODAPHNIA) DENTIFERA	COLBOURNE & HEBERT, 1996 INCLUDES ROSEA
197	DAP LSPINA	DAPHNIA (HYALODAPHNIA) LONGISPINA	O.F. MULLER, 1785 EMEND. COLBOURNE & HEBERT, 1996
168	DAP SP	DAPHNIA SP.	O.F. MULLER, 1785
710	DAP DAP	DAPHNIA (DAPHNIA) SP	O.F. MULLER, 1785 IN BROOKS 1957
660	DAP CTEN	DAPHNIA (CTENODAPHNIA) SP	DYBOWSKI & GROCHOWSKI 1895
659	DAP MAG	DAPHNIA (CTENODAPHNIA) MAGNA	STRAUS, 1820
711	DAP HYA	DAPHNIA (HYALODAPHNIA) SP	O.F. MULLER, 1785 EMEND. COLBOURNE & HEBERT, 1996
146	SIM SERR	SIMOCEPHALUS SERRULATUS	KOCH, 1841
147	SIM VETU	SIMOCEPHALUS VETULUS	SCHOEDLER, 1858
186	SIMOC SP	SIMOCEPHALUS SP.	SCHOEDLER, 1858
143	SCA AURI	SCAPHOLEBERIS AURITA	FISCHER, 1849
144	SCA KIN	SCAPHOLEBERIS KINGI	SARS, 1903
184	SCAP SP	SCAPHOLEBERIS SP.	SCHOEDLER, 1858
111	CER LAC	CERIODAPHNIA LACUSTRIS	BIRGE, 1893
112	CER MEG	CERIODAPHNIA MEGALOPS	SARS, 1861

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus.

	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR / CITATION
113	CER PUL	CERIODAPHNIA PULCHELLA	SARS, 1862
114	CER RETIC	CERIODAPHNIA RETICULATA	JURINE, 1820
151	CER QUAD	CERIODAPHNIA QUADRANGULA	O.F. MULLER, 1785
115	CER SP	CERIODAPHNIA SP.	DANA, 1853
110	BOS SPP	B. FREYI, LIEDERI OR LONGISPINA	
188	B (B) LONG	BOSMINA (BOSMINA) LONGIROSTRIS	O.F. MULLER, 1785 DE MELO & HEBERT, 1994
132	E (E) CORE	EUBOSMINA (EUBOSMINA) COREGONI COREGONI	BAIRD, 1857 HANEY & TAYLOR 2003
150	E (E) LONG	EUBOSMINA (EUBOSMINA) LONGISPINA	LEYDIG, 1860 DE MELO & HEBERT, 1994 TAYLOR 2002
156	E (E) SP	EUBOSMINA (EUBOSMINA) SP.	SELIGO, 1900 DE MELO & HEBERT, 1994 TAYLOR 2002
193	E (L) ORI	EUBOSMINA (LUNOBOSMINA) ORIENS	DE MELO & HEBERT, 1994 TAYLOR 2002
194	E (E) MAR	EUBOSMINA (EUBOSMINA) MARITIMA	P.E. MUELLER, 1868 DE MELO & HEBERT, 1994 TAYLOR 2002
191	E (N) HUAR	EUBOSMINA (NEOBOSMINA) HUARONENSIS	DELACHAUX, 1918 PAGGI, 1979 DE MELO & HEBERT, 1994 TAYLOR 2002
192	E (N) HAGM	EUBOSMINA (NEOBOSMINA) HAGMANNI	STINGELIN, 1904 DE MELO & HEBERT, 1994 TAYLOR 2002
133	E (N) TUB	EUBOSMINA (NEOBOSMINA) TUBICEN	BREHM, 1953 DE MELO & HEBERT 1994 TAYLOR 2002
189	B (S) FREY	BOSMINA (BOSMINA) FREYI	DE MELO & HEBERT, 1994 TAYLOR 2002
190	B (S) LIED	BOSMINA (BOSMINA) LIEDERI	DE MELO & HEBERT, 1994 TAYLOR 2002
195	E (N) SPP	EUBOSMINA (NEOBOSMINA) SP.	LIEDER, 1957 TAYLOR 2002
164	BOS SP	BOSMINA SP.	O. F. MULLER, 1785
653	EUB SP	EUBOSMINA SP.	TAYLOR 2002
654	E (L) SP	EUBOSMINA LUNOBOSMINA SP	TAYLOR 2002
140	OPH GRAC	OPHRYOXUS GRACILIS	SARS, 1861 (G.O. SARS 1862) in Smirnov 1992
179	OPHR SP	OPHRYOXUS SP.	SARS, 1861
148	STR SERR	STREBLOCERUS SERRICAUDATUS	FISCHER, 1849
198	STR SP	STREBLOCERUS SP	SARS, 1862
101	ACA CURV	ACANTHOLEBERIS CURVIROSTRIS	O.F. MULLER 1776
160	ACAN SP	ACANTHOLEBERIS SP.	LILLJEBORG, 1853
136	ILY SPIN	ILYOCRYPTUS SPINIFER	HERRICK, 1884
174	ILY SP	ILYOCRYPTUS SP.	SARS, 1861
139	MAC LAT	MACROTHRIX LATICORNIS	JURINE, 1820 (FISCHER, 1851) in Smirnov 1992
178	MACROTH	MACROTHRIX SP.	BAIRD, 1843
102	ACR HARP	ACROPERUS HARPAE	BAIRD, 1843
161	ACROP	ACROPERUS SP.	BAIRD, 1843
134	EUR LAM	EURYCERCUS (BULLATIFRONS) LONGIROSTRIS	O.F. MULLER, 1785 HANN, 1982
170	EURYC SP	EURYCERCUS SP.	O.F. MULLER, 1785
175	KUR SP	KURZIA SP.	DYBOWSKI & GROCHOWSKI 1894
166	CAMPTO	CAMPTOCERCUS SP.	BAIRD, 1843
706	C RECT	CAMPTOCERCUS RECTIROSTRIS	SCHOEDLER, 1862
196	GRAP TES	GRAPTOLEBERIS TESTUDINARIA	FISCHER, 1851
172	GRAP SP	GRAPTOLEBERIS SP.	

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus

Code	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR / CITATION
180	OXY SP	OXYURELLA SP.	DYBOWSKI & GROCHOWSKI 1894
103	ALO AFFI	ALONA AFFINIS	LEYDIG, 1860
104	ALO COST	ALONA COSTATA	SARS, 1862
105	ALO GUTT	ALONA GUTTATA	SARS, 1862
106	ALO INTE	ALONA INTERMEDIA	SARS, 1862
107	ALO QUAD	ALONA QUADRANGULARIS	O.F. MULLER, 1785
108	ALO RECT	ALONA RECTANGULA	SARS, 1861
109	ALO SP	ALONA SP.	BAIRD, 1850
171	DISP SP	DISPARALONA SP	FRYER 1968
155	DISP ACUT	DISPARALONA ACUTIROSTRIS	(BIRGE, 1879) FRYER G. 1971 IN SMIRNOV 1996
141	DISP HAMA	DISPARALONA HAMATA	(BIRGE 1879) FREYER 1968 in Smirnov 1996
157	AL NANA	ALONELLA NANA	BAIRD, 1850
162	ALONEL	ALONELLA SP.	SARS, 1862
163	ANCHIS	ANCHISTROPUS SP.	SARS, 1862
181	PLEU SP	PLEUROXUS SP.	BAIRD, 1843
116	CHY BIC	CHYDORUS BICORNUTUS	DOOLITTLE, 1909
117	CHY PIG	CHYDORUS PIGER	SARS, 1862
118	CHY SPHA	CHYDORUS SPHAERICUS	O.F. MULLER, 1785
167	CHY SP	CHYDORUS SP.	LEACH, 1816
153	CHY GLOB	PSEUDOCHYDORUS GLOBOSUS	BAIRD, 1843
183	PSEUD SP	PSEUDOCHYDORUS SP.	FRYER, 1968
142	POL PED	POLYPHEMUS PEDICULUS	LINNE, 1761
182	POLYP SP	POLYPHEMUS SP.	O.F. MULLER, 1785
138	LEP KIN	LEPTODORA KINDTII	FOCKE, 1844
177	LEPTO SP	LEPTODORA SP.	LILLJEBORG, 1860
149	BYT CEDE	BYTHOTREPHES CEDERSTROEMI (DISCONTINUED)	SCHOEDLER, 1877 DISCONTINUED NOW LONGIMANUS
158	BYT LONG	BYTHOTREPHES LONGIMANUS	LEYDIG, 1860 BERG & GARTON, 1994 THERRIAULT ET AL 2002
165	BYTHO SP	BYTHOTREPHES SP.	LEYDIG, 1860
154	C PENGOI	CERCOPAGIS PENGOI	OSTROUMOV, 1891
199	UNID CLAD	UNIDENTIFIED CLADOCERAN	

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus

CodeD	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR
		COPEPODA	
201	CAL COP	CALANOID COPEPODID	
220	NAUP	NAUPLIUS-CALANOID OR CYCLOPOID	
221	COP	COPEPODID-CALANOID OR CYCLOPOID	
222	UNID CAL	UNIDENTIFIED CALANOIDA	MAUCHLINE, 1988
215	CAL NAUP	CALANOID NAUPLIUS	
203	AGLA LEPT	AGLAODIAPTOMUS LEPTOPUS	S.A. FORBES, 1882 LIGHT, 1938 DUSSART & DEFAYE, 1995
225	AGLAO SP	AGLAODIAPTOMUS SP.	LIGHT, 1938
229	HESPER SP	HESPERODIAPTOMUS SP.	LIGHT, 1938
202	LEPTO ASHL	LEPTODIAPTOMUS ASHLANDI	MARSH, 1893 LIGHT, 1938 DUSSART & DEFAYE, 1995
204	LEPTO MIN	LEPTODIAPTOMUS MINUTUS	LILLJEBORG, 1889 LIGHT, 1938 DUSSART & DEFAYE, 1995
208	LEPTO SICI	LEPTODIAPTOMUS SICILIS	S.A. FORBES, 1882 LIGHT, 1938 DUSSART & DEFAYE, 1995
209	LEP SICILO	LEPTODIAPTOMUS SICILOIDES	LILLJEBORG, 1889 LIGHT, 1938 DUSSART & DEFAYE, 1995
230	LEPTO SP	LEPTODIAPTOMUS SP.	LIGHT, 1938
207	ONY SANG	ONYCHODIAPTOMUS SANGUINEUS	FORBES, 1876 LIGHT, 1939 DUSSART & DEFAYE, 1995
232	ONYCHO SP	ONYCHODIAPTOMUS SP.	LIGHT, 1939
205	SKIS OREG	SKISTODIAPTOMUS OREGONENSIS	LILLJEBORG, 1889 LIGHT, 1939 DUSSART & DEFAYE, 1995
206	SKIS REIG	SKISTODIAPTOMUS REIGHARDI	MARSH, 1895 LIGHT, 1939 DUSSART & DEFAYE, 1995
234	SKISTO	SKISTODIAPTOMUS SP.	LIGHT, 1939
217	DI STAG	DIAPTOMUS STAGNALIS	S.A. FORBES, 1882
226	DIAPT SP	DIAPTOMUS SP.	WESTWOOD, 1836
228	EURYT SP	EURYTEMORA SP.	GIESBRECHT, 1881
210	EPI LAC	EPISCHURA LACUSTRIS	S.A. FORBES, 1882
211	E LAC CO	EPISCHURA LACUSTRIS COPEPODID	S.A. FORBES, 1882
227	EPIS SP	EPISCHURA SP.	FORBES, 1882
212	LIM MACR	LIMNOCALANUS MACRURUS	SARS, 1863
218	LI MA COP	LIMNOCALANUS MACRURUS COPEPODID	SARS, 1863
219	LI MA NAU	LIMNOCALANUS MACRURUS NAUPLIUS	SARS, 1863
231	LIMNO SP	LIMNOCALANUS SP.	SARS, 1863
213	SEN CALA	SENECELLA CALANOIDES	JUDAY, 1923
214	S CAL CO	SENECELLA CALANOIDES COPEPODID	JUDAY, 1923
216	SE CA NAU	SENECELLA CALANOIDES NAUPLIUS	JUDAY, 1923
233	SENEC SP	SENECELLA SP.	JUDAY, 1923
321	CYCLOPS	CYCLOPS SP.	O.F. MULLER, 1785
301	CYC COP	CYCLOPOID COPEPODID	O.F. MULLER, 1785
313	CYC NAUP	CYCLOPOID NAUPLIUS	O.F. MULLER, 1785
303	CYC SCUT	CYCLOPS SCUTIFER	SARS, 1863
304	CYC VERN	ACANTHOCYCLOPS VERNALIS (DISCONTINUED)	FISCHER, 1853, KIEFER, 1978 DISCONTINUED SPECIES SPLIT
346	ACA BREVI	ACANTHOCYCLOPS BREVISPINOSUS	HERRICK 1984 SPLIT FROM ACA NERN HUDSON 1998
339	ACA ROB	ACANTHOCYCLOPS ROBUSTUS	SARS, 1863 SPLIT FROM ACA NERN HUDSON 1998
340	ACA VENU	ACANTHOCYCLOPS VENUSTOIDES	COKER, 1934
341	A V BIS	ACANTHOCYCLOPS VENUSTOIDES BISPINOSUS	YEATMAN, 1951
342	ACA CAR	ACANTHOCYCLOPS CAROLINIANUS	YEATMAN, 1944
320	ACAN SP	ACANTHOCYCLOPS SP.	KIEFER, 1927
302	DIA THOM	DIACYCLOPS THOMASI	S.A. FORBES, 1882 GURNEY 1933, YEATMAN 1959, DUSSART, 1969
322	DIA CYC	DIACYCLOPS SP.	KIEFER, 1927
306	EUC AGIL	EUCYCLOPS AGILIS	KOCH, 1838 , FORBES 1887 , TORKE 1976

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus

Code	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR
307	EUC SPER	EUCYCLOPS SPERATUS (DISCONTINUED)	LILLJEBORG, 1901 HERRICK 1884 , NOW EU ELEG REID & REED 1998
347	EU ELEG	EUCYCLOPS ELEGANS	EMEND REID & REED 1998 unpub. data
333	EUC SERR	EUCYCLOPS SERRULATUS (DISCONTINUED)	FISCHER, 1851 KIEFER, 1978 NOW EUC. AGILIS 306 REID & REED 1998
334	EUC NEOM	EUCYCLOPS NEOMACRUROIDES (DISCONTINUED)	DUSSART & FERNANDO, 1990 NOW EU ELEG 347 HUDSON 1998
335	E M DENT	EUCYCLOPS MACRUROIDES DENTICULATUS	
336	EUC PRIO	EUCYCLOPS PRIONOPHORUS	KIEFER, 1931
325	EUCYC	EUCYCLOPS SP.	CLAUS, 1893
332	ECTO POLY	ECTOCYCLOPS POLYSPINOSUS	HARADA, 1931
323	ECTOCYC	ECTOCYCLOPS SP.	BRADY, 1904
305	ERGASIL	ERGASILUS SPP	NORDMANN, 1832
308	MAC ALBI	MACROCYCLOPS ALBIDUS	JURINE, 1820
326	MACROC	MACROCYCLOPS SP.	CLAUS, 1893
309	MES EDAX	MESOCYCLOPS EDAX	S.A. FORBES, 1891
343	MES AMER	MESOCYCLOPS AMERICANUS	DUSSART,
327	MESOC	MESOCYCLOPS SP.	SARS, 1914
328	MICROC	MICROCYCLOPS SP.	CLAUS, 1893
310	ORT MODE	ORTHOCYCLOPS MODESTUS	HERRICK, 1883
329	ORTHOC	ORTHOCYCLOPS SP.	FORBES, 1897
311	PARA POPP	PARACYCLOPS POPPEI	REHBERG, 1880 FRENZEL 1977 IN HUDSON ET AL 1998
330	PARAC	PARACYCLOPS SP.	CLAUS, 1893
312	T P MEX	TROPOCYCLOPS PRASINUS MEXICANUS	KIEFER, 1938 HUDSON 1998 REINSTATED FROM EXTENSUS
337	T P PRAS	TROPOCYCLOPS PRASINUS PRASINUS	FISCHER, 1860 KIEFER, 1978
338	TRO EXT	TROPOCYCLOPS EXTENSUS	KIEFER, 1931 DISCONTINUED NOW PRASINUS MEXICANUS
331	TROPOC	TROPOCYCLOPS SP.	KIEFER, 1927
		HARPACTICOIDA	
344	HARP NAUP	HARPACTICOIDA NAUPLIUS	LANG, 1948
345	HARP SP	HARPACTICOIDA SPP	LANG, 1948
401	K SER CUR	KERATELLA SERRULATA CURVICORNIS	EHRENBERG, 1838
501	ANU FISS	ANURAEOPSIS FISSA	GOSSE, 1851
502	ANU SP	ANURAEOPSIS SP.	LAUTERBORN, 1900
503	ASC ECA	ASCOMORPHA ECAUDIS	PERTY, 1850
504	ASC OVAL	ASCOMORPHA OVALIS	BERGENDAL, 1892
505	ASC SP	ASCOMORPHA SP.	PERTY, 1850
506	ASP HERR	ASPLANCHNA HERRICKI	DE GUERNE, 1888
507	ASP PRIO	ASPLANCHNA PRIODONTA	GOSSE, 1850
508	ASP SP	ASPLANCHNA SP.	GOSSE, 1850
509	ASP MULT	ASPLANCHNOPUS MULTICEPS	SCHRANK, 1793
510	AS_OPSIS	ASPLANCHNOPUS SP.	DE GUERNE, 1888
511	BRA ANGU	BRACHIONUS ANGULARIS	GOSSE, 1851
512	BRA CALY	BRACHIONUS CALYCIFLORUS	PALLAS, 1766
513	BRA HAVA	BRACHIONUS HAVANAENSIS	ROUSSELET, 1911
514	BRA PATU	BRACHIONUS PATULUS	O.F. MULLER, 1786
515	BRA QUAD	BRACHIONUS QUADRIDENTATUS	HERMANN, 1783
516	BRA URCE	BRACHIONUS URCEOLARIS	O.F. MULLER, 1773
517	BRAC SP	BRACHIONUS SP.	PALLAS, 1766

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus

Code	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR
518	CEPHA SP	CEPHALODELLA SP.	BORY DE ST. VINCENT, 1826
519	CHRO OVA	CHROMOGASTER OVALIS	BERGENDAL, 1892
520	CHRO SP	CHROMOGASTER SP.	LAUTERBORN, 1893
521	COL MUT	COLLOTHECA MUTABILIS	HUDSON, 1885
522	COL SP	COLLOTHECA SP.	HARRING, 1913
523	COLU UNC	COLURELLA UNCINATA	O.F. MULLER, 1773
524	COLU SP	COLURELLA SP.	BORY DE ST. VINCENT, 1824
525	CONO COE	CONOCHILOIDES COENOBASIS	HUDSON, 1885
526	CONO EXI	CONOCHILOIDES EXIGUUS	AHLSTROM, 1938
527	CONO NAT	CONOCHILOIDES NATANS	SELIGO, 1900
528	CONO SP	CONOCHILOIDES SP.	HLAVA, 1904
529	CON HIPP	CONOCHILUS HIPPOCREPIS	SCHRANK, 1803
530	CON UNI	CONOCHILUS UNICORNIS	ROUSSELET, 1892
531	CON SP	CONOCHILUS SP.	EHRENBERG, 1834
532	EUCHL SP	EUCHLANIS SP.	EHRENBERG, 1832
533	FIL LONG	FILINIA LONGISETA	EHRENBERG, 1834
534	FIL TERM	FILINIA TERMINALIS	PLATE, 1886
535	FIL SP	FILINIA SP.	BORY DE ST. VINCENT, 1824
536	GAS HYPT	GASTROPUS HYPTOPUS	EHRENBERG, 1838
537	GAS STYL	GASTROPUS STYLIFER	IMHOF, 1891
538	GAS SP	GASTROPUS SP.	IMHOF, 1888
539	HEX SP	HEXARTHRA SP.	SCHMARDA, 1854
540	KEL BOST	KELLICOTTIA BOSTONIENSIS	ROUSSELET, 1908
541	KEL LONG	KELLICOTTIA LONGISPINA	KELLICOTT, 1879
542	KEL SP	KELLICOTTIA SP.	AHLSTROM, 1938
543	KER COCH	KERATELLA COCHLEARIS	GOSSE, 1851
544	KER CRAS	KERATELLA CRASSA	AHLSTROM, 1943
545	KER EARL	KERATELLA EARLINAE	AHLSTROM, 1943
546	KER HIEM	KERATELLA HIEMALIS	CARLIN, 1943
547	KER QUAD	KERATELLA QUADRATA	O.F. MULLER, 1786
548	KER TAUR	KERATELLA TAUROCEPHALA	MYERS, 1938
549	KER TEST	KERATELLA TESTUDO	EHRENBERG, 1832
550	KER SP	KERATELLA SP.	BORY DE ST. VINCENT, 1822
551	LEC LIGO	LECANE LIGONA	DUNLOP, 1901
552	LEC LUNA	LECANE LUNA	O.F. MULLER, 1776
553	LEC MIRA	LECANE MIRA	MURRY, 1913
554	LEC SIG	LECANE SIGNIFERA	JENNINGS, 1896
555	LEC SP	LECANE SP.	NITZSCH, 1827
556	LEP ACUM	LEPADELLA ACUMINATA	EHRENBERG, 1834
557	LEP PAT	LEPADELLA PATELLA	O.F. MULLER, 1786
558	LEP SP	LEPADELLA SP.	BORY DE ST. VINCENT, 1826
559	MONO SP	MONOMMATA SP.	
560	MON BULL	MONOSTYLA BULLA	GOSSE, 1886
561	MON LUN	MONOSTYLA LUNARIS	EHRENBERG, 1832
562	MON QUAD	MONOSTYLA QUADRIDENTATA	EHRENBERG, 1832
563	MON SP	MONOSTYLA SP.	EHRENBERG, 1830
564	NOTH ACU	NOTHOLCA ACUMINATA	EHRENBERG, 1832
565	NOTH LAB	NOTHOLCA LABIS	GOSSE, 1887
566	NOTH SQU	NOTHOLCA SQUAMULA	O.F. MULLER, 1786
567	NOTH SP	NOTHOLCA SP.	GOSSE, 1886

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus

Code	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR
568	PLA PATU	PLATYIAS PATULUS	O.F. MULLER, 1786
569	PLA SP	PLATYIAS SP.	HARRING, 1913
570	PLOE LEN	PLOESOMA LENTICULARE	HERRICK, 1885
571	PLOE TRI	PLOESOMA TRIACANTHUM	BERGENDAL, 1892
572	PLOE TRU	PLOESOMA TRUNCATUM	LEVANDER, 1894
573	PLOE SP	PLOESOMA SP.	HERRICK, 1885
574	POLY DOL	POLYARTHRA DOLICHOPTERA	IDELSON, 1925
575	POLY EUR	POLYARTHRA EURYPTERA	WIERZEJSKI, 1893
576	POLY MAJ	POLYARTHRA MAJOR	BURCKHARDT, 1900
577	POLY REM	POLYARTHRA REMATA	SKORIKOV, 1896
578	POLY VUL	POLYARTHRA VULGARIS	CARLIN, 1943
579	POLY SP	POLYARTHRA SP.	EHRENBERG, 1832
580	POM SUL	POMPHOLYX SULCATA	HUDSON, 1885
581	POM SP	POMPHOLYX SP.	GOSSE, 1851
582	SYN OBL	SYNCHAETA OBLONGA	EHRENBERG, 1832
583	SYN PEC	SYNCHAETA PECTINATA	EHRENBERG, 1832
584	SYN STYL	SYNCHAETA STYLATA	WIERZEJSKI, 1893
585	SYN SP	SYNCHAETA SP.	EHRENBERG, 1832
586	TEST PAT	TESTUDINELLA PATINA	HERMAN, 1783
587	TEST SP	TESTUDINELLA SP.	BORY DE ST. VINCENT, 1826
588	TRIC CYL	TRICHOCERCA CYLINDRICA	IMHOF, 1891
589	TRIC HIP	TRICHOCERCA HIPPOCREPIS	SCHRANK, 1803
590	TRIC MUL	TRICHOCERCA MULTICRINIS	KELLICOTT, 1897
591	TRIC LON	TRICHOCERCA LONGISETA	SCHRANK, 1805
592	TRIC POR	TRICHOCERCA PORCELLUS	GOSSE, 1886
593	TRIC ROU	TRICHOCERCA ROUSSELETI	VOIGT, 1901
594	TRIC SIM	TRICHOCERCA SIMILIS	WIERZEJSKI, 1893
595	TRIC SP	TRICHOCERCA SP.	LAMARCK, 1801
596	TRI POCI	TRICHOTRIA POCILLUM	O.F. MULLER
597	TRI TETR	TRICHOTRIA TETRACTIS	EHRENBERG, 1830
598	TRI SP	TRICHOTRIA SP.	BORY DE ST. VINCENT, 1827
599	UNID ROT	UNIDENTIFIED ROTIFER	
601	C PUNC 1	CHAOBORUS PUNCTIPENNIS INSTAR 1	SAY, 1823
602	C PUNC 2	CHAOBORUS PUNCTIPENNIS INSTAR 2	SAY, 1823
603	C PUNC 3	CHAOBORUS PUNCTIPENNIS INSTAR 3	SAY, 1823
604	C PUNC 4	CHAOBORUS PUNCTIPENNIS INSTAR 4	SAY, 1823
605	C PUNC P	CHAOBORUS PUNCTIPENNIS PUPA	SAY, 1823
606	C PUNC	CHAOBORUS (SAYOMYIA) PUNCTIPENNIS	SAY, 1823 EMEND. SAETHER 1972
607	C FLAV 1	CHAOBORUS FLAVICANS INSTAR 1	MEIGEN, 1830
608	C FLAV 2	CHAOBORUS FLAVICANS INSTAR 2	MEIGEN, 1830
609	C FLAV 3	CHAOBORUS FLAVICANS INSTAR 3	MEIGEN, 1830
610	C FLAV 4	CHAOBORUS FLAVICANS INSTAR 4	MEIGEN, 1830
611	C FLAV P	CHAOBORUS FLAVICANS PUPA	MEIGEN, 1830
612	C FLAV	CHAOBORUS FLAVICANS	MEIGEN, 1830
613	C TRIV 1	CHAOBORUS TRIVITTATUS INSTAR 1	LOEW, 1862
614	C TRIV 2	CHAOBORUS TRIVITTATUS INSTAR 2	LOEW, 1862
615	C TRIV 3	CHAOBORUS TRIVITTATUS INSTAR 3	LOEW, 1862
616	C TRIV 4	CHAOBORUS TRIVITTATUS INSTAR 4	LOEW, 1862
617	C TRIV P	CHAOBORUS TRIVITTATUS PUPA	LOEW, 1862
618	C TRIV	CHAOBORUS TRIVITTATUS	LOEW, 1862

Z_TAXA: Principle names and codes of taxa in the Z_TAXA table sorted by genus

Code	SPP_ABBREV	SPP_NAME	ORIGIN_AUTHOR
619	C AMER 1	CHAOBORUS AMERICANUS INSTAR 1	JOHANNSEN, 1903
620	C AMER 2	CHAOBORUS AMERICANUS INSTAR 2	JOHANNSEN, 1903
621	C AMER 3	CHAOBORUS AMERICANUS INSTAR 3	JOHANNSEN, 1903
622	C AMER 4	CHAOBORUS AMERICANUS INSTAR 4	JOHANNSEN, 1903
623	C AMER P	CHAOBORUS AMERICANUS PUPA	JOHANNSEN, 1903
624	C AMER	CHAOBORUS AMERICANUS	JOHANNSEN, 1903
625	C ALBA 1	CHAOBORUS ALBATUS INSTAR 1	JOHNSON, 1921
626	C ALBA 2	CHAOBORUS ALBATUS INSTAR 2	JOHNSON, 1921
627	C ALBA 3	CHAOBORUS ALBATUS INSTAR 3	JOHNSON, 1921
628	C ALBA 4	CHAOBORUS ALBATUS INSTAR 4	JOHNSON, 1921
629	C ALBA P	CHAOBORUS ALBATUS PUPA	JOHNSON, 1921
630	C ALBA	CHAOBORUS ALBATUS	JOHNSON, 1921
631	CHAOB SP	CHAOBORUS SP.	LICHTENSTEIN, 1800
632	CHAO PUP	CHAOBORUS SP. PUPA	LICHTENSTEIN, 1800
633	CHAOB I1	CHAOBORUS SP. INSTAR 1	LICHTENSTEIN, 1800
634	CHAOB I2	CHAOBORUS SP. INSTAR 2	LICHTENSTEIN, 1800
635	CHAOB I3	CHAOBORUS SP. INSTAR 3	LICHTENSTEIN, 1800
636	CHAOB I4	CHAOBORUS SP. INSTAR 4	LICHTENSTEIN, 1800
637	MYSIS	MYSIS OCULATA RELICTA	LOVEN, IN PENNAK 1978
650	DREI SP	DREISENNA SP	
651	DREI POLY	DREISENNA POLYMORPHA	PALLAS
652	DREI BUGE	DREISENNA BUGENSIS	
701	PERIDIN	PERIDINIUM SPP.	
702	DINOBRYON	DINOBRYON SPP. COLONIES	
703	CERATIUM	CERATIUM HIRUNDINELLA	

Appendix 5

Summary of Biology Projects Using Benthos

1987 – 2006

Appendix 5. SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1987 Gravenhurst Bay	Neil Hutchinson		870731-870910	Q(ml. Per second)	benthic invertebrates Water chemistry	D - net
1988 spring leech surveys Lakes Experimental	Greg Mierle Ron Reid	Plastic, Crosson, Blue Chalk Harp	880607-880617	none	leeches	acrylic traps
1988 spring benthic surveys lakes Temporal	Greg Mierle Ron Reid	12 temporal lakes - Blue Chalk, Clear, Cradle, Crosson, Delano, Hamer, Harp, Plastic, Skidway, Pincher, Westward, Young	880420-880620	temperature substrate descriptions	benthic invertebrates	D - net
1988 spring benthic surveys lakes Experimental	Greg Mierle Ron Reid	Blue Chalk	880517, 880620, 880621, 880906, 881102, 881103 Air samples only	temperature	benthic invertebrates	T - sampler (Reference?) Air samples - compressor used reference?
1988 spring benthic surveys lakes QA/QC	Greg Mierle Ron Reid	Harp (880502/880510)	weekly samples	temperature substrate descriptions	benthic invertebrates	D - net
1988 spring benthic QA/QC	Greg Mierle Ron Reid	Pincher	same date replicates	temperature substrate descriptions	benthic invertebrates	D - net

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY (FIELD)	METHODOLOGY (LAB)	PERSONNEL	COMMENTS
1987 Gravenhurst Bay			Ron Reid, B. Carson, S. Shortreed, B. Clark, D. L., D. M., D. Geiling, R. Girard, J.S.	
1988 spring leech surveys Lakes Experimental	traps set at 5 sites; i.e. benthic sampling sites, bait was pieces of beef, chicken parts, lettuce	samples anaesthetized for 10 minutes in soda water, then preserved in ethanol.	Shelly Zeran Ron Reid	
1988 spring benthic surveys lakes Temporal	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)	Shelly Zeran, Doug Geiling Ron Reid Joe Findeis, Trevor Pawson A. W.	
1988 spring benthic surveys lakes Experimental	T- sampler pushed into the substrate at each of 5 sites: sample transferred to a plastic Storage bottle	sample preserved with 95% ethanol: samples never picked or identified	Ron Reid, Joe Findeis Shelly Zeran	
1988 spring benthic surveys lakes QA/QC	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)		
1988 spring benthic QA/QC	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)		

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1988 fall benthic surveys Lakes Temporal	Greg Mierle Ron Reid	12 temporal lakes - Blue Chalk Clear, Cradle, Crosson, Delano Hamer, Harp, Plastic, Skidway, Pincher, Westward, Young	880901	temperature substrate descriptions		
1988 fall benthic surveys lakes Spatial	Greg Mierle Ron Reid	Clayton, Clyde, Deavy, Doughnut, Hunter, Johnson, Pine, Pipio, Sugarbush, Tonakela	880901-881027	temperature substrate descriptions	benthic invertebrates water chemistry	D - net
1989 leech surveys lakes Experimental	Greg Mierle Ron Reid	Skidway, Paint, Red Chalk Pond Blue Chalk, Crosson, Harp, Hamer, Plastic	890509-890621	temperature minimal site description	leeches	acrylic traps, minnow traps
1989 fall benthic survey lakes Temporal	Greg Mierle Ron Reid	14 temporal lakes, as per 1988 fall benthic survey (12) plus Heney and Pearceley	891023-891108	temperature substrate descriptions	benthic invertebrates water chemistry	D - net
1990 fall benthic survey lakes Temporal	Greg Mierle Ron Reid	14 temporal lakes, as per 1988 fall benthic survey (12) plus Heney and Pearceley	901015-901101	temperature substrate descriptions	benthic invertebrates water chemistry	D - net
1991 fall benthic survey lakes Temporal	Keith Somers Ron Reid	14 temporal lakes	911021-911114	temperature substrate descriptions	benthic invertebrates water chemistry	D - net

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY (FIELD)	METHODOLOGY (LAB)	PERSONNEL	COMMENTS
1988 fall benthic surveys Lakes Temporal	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)	Ron Reid, Trevor Pawson Sheila David	
1988 fall benthic surveys lakes Spatial	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)	Ron Reid, Sheila David D. Sankey	3 sites only at Johnson Lake
1989 leech surveys lakes Experimental	Skidway - 20 traps, Paint - 19 traps Red Chalk Pond - 20 traps Blue Chalk - 10 traps, Crosson 20 traps, Harp - 20 traps, Plastic 20 traps/beef scraps, suckers, liver	samples anaesthetized for 10 minutes in Soda water, then preserved in ethanol. Samples sent to Biotax (B. Bilyj) for identification.	Cheryl Partridge Sheila David	
1989 fall benthic survey lakes Temporal	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)	Ron Reid, Sheila David Dan Van Bakel	2 lakes added to temporal series in 1989 Heney and Pearceley lakes
1990 fall benthic survey lakes Temporal	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)	Ron Reid, Sheila David	
1991 fall benthic survey lakes Temporal	5 sites per lake collected with a D - net. Transects perpendicular to shore were sampled: the number of transects depended on The morphometry of the lake bottom	Samples placed under heat lamps to drive invert. To top making picking easier. samples dyed with Eosin B and Biebrich Scarlet to stain organisms red. The entire samples were picked and sent for identification to Biotax (Bohdan Bilyj)	R. Girard, Sheila David Ron Ingram, Brad Armstrong, Dave Howel, W. C. York U.	Mouse and Ranger lakes were sampled in support of work by D. McQueen

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1992 fall benthic surveys Lakes Temporal	Keith Somers Ron Reid	14temporal lakes - (plus 2 spatial Mouse and Ranger)	921013-921105	temperature substrate descriptions	benthic invertebrates water chemistry	D - net
1993 fall benthic surveys lakes Spatial	Keith Somers Ron Reid	14 temporal lakes (plus 2 spatial Mouse and Ranger)	931026-931110	temperature substrate descriptions	benthic invertebrates water chemistry	D - net
1993 fall benthic surveys lakes QA/QC	Keith Somers Ron Reid	1: Plastic Lake	931118	temperature substrate descriptions	benthic invertebrates water chemistry	D - net
1994 fall benthic survey lakes Spatial	Keith Somers Ron Reid	Mouse/Ranger, Timberwolf, Middle, Hannah, Clearwater, Lohi, Scugog, Balsam, Dickie, Clayton, Bigwind, Louisa, Koshlong, Ridout, Basshaunt, Twelve Mile, Moot, Fawn, Red Chalk East, Chub	941003-941107 substrate descriptions (I.e., % of substrate	temperature, detailed on the lake floor and in the water column)	benthic invertebrates water chemistry	D - net
1994 fall benthic survey lakes Temporal	Keith Somers Ron Reid	Blue Chalk, Crosson, Harp, Heney, Plastic	941011-941107	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
1995 fall benthic survey lakes Spatial	Keith Somers Ron Reid	11 lakes: Glen, Dickey, Meach, Brandy, Leonard, Kawagama, Bear, Chemong, Buckhorn, Buck, Smoke	951016-951122	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
1995 fall benthic survey lakes Temporal	Keith Somers Ron Reid	8 lakes: Heney, Plastic, Pearceley, Harp, Blue Chalk, Westward, Hamer, Young	951003-951120	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY (FIELD)	METHODOLOGY PERSONNEL (LAB)	COMMENTS
		Organisms were identified by BIOTAX According to the portion of the sample Where they were found: i.e., heat or Residue	
1992 fall benthic surveys Lakes Temporal	5 sites per lake collected with a D - net.	Samples were dyed, picked and sent for Identification to BIOTAX (Bohdan Bilyj)	Ron Reid, Sheila David R. Girard, Steve G.
1993 fall benthic surveys lakes Spatial	5 sites per lake collected with a D - net.	Samples were dyed, picked and sent for Identification to BIOTAX (Bohdan Bilyj)	Ron Reid, Sheila David Keith Somers, Ron Ingram, Jo Findeis
1993 fall benthic surveys lakes QA/QC	5 sites per lake collected with a D - net.	Samples were dyed, picked and sent for Identification to BIOTAX (Bohdan Bilyj)	Ron Ingram, Sheila David
1994 fall benthic survey lakes Spatial	5 sites per lake collected with a D - net.	Samples no longer sent for identification; Rapid bioassessment protocol used. Samples were identified to order; as for Streams in 1994; 100 organisms picked And recorded on field sheets. Remainder of samples were preserved in ethanol	Ron Reid, Sheila David, Keith Somers, Ron Ingram, Kim Ralph
1994 fall benthic survey lakes Temporal	5 sites per lake collected with a D - net.	Rapid bioassessment - 100 organisms only picked and identified to order.	Ron Reid, Sheila David, Keith Somers, Ron Ingram,
1995 fall benthic survey lakes Spatial	5 sites per lake collected with a D - net.	Rapid bioassessment - 100 organisms only picked and identified to order.	Ron Reid, Sheila David, Joe Findeis, Ron Ingram,
1995 fall benthic survey lakes Temporal	5 sites per lake collected with a D - net.	Rapid bioassessment - 100 organisms only picked and identified to order.	Ron Reid, Sheila David, Keith Somers, Ron Ingram, R. Girard

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT DESCRIPTION
1996 fall benthic surveys Lakes Temporal	Keith Somers Ron Reid	Red Chalk East, Red Chalk Main, Blue Chalk, Plastic, Harp, Heney, Crosson, Dickie, Chub	961010-961105	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
1996 fall benthic surveys lakes Wetlands	Keith Somers Ron Reid	Dawson Pond, Plot #2-Pond #9 Avery Pond, Plot #2-Pond #19, Slim Pond, Rush Pond, Duck Pond, Red Chalk #1 Pond	960918-9610??	temperature substrate descriptions GIS measurements	benthic invertebrates water chemistry	D - net
1997 spring benthic survey	Ron Reid Sheila David	Lake Couchiching	970528-970604	temperature substrate descriptions	benthic invertebrates water chemistry	D - net
1997 fall benthic surveys Lakes Temporal	Keith Somers Ron Reid	Red Chalk East, Red Chalk Main, Blue Chalk, Plastic, Harp, Heney, Crosson, Dickie, Chub	971014-971105	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
1997 ice-free benthic temporal study	Keith Somers Ron Reid	Paint Lake	970616-971110	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
1998 ice-free benthic temporal study	Keith Somers Ron Reid	Blue Chalk, Clear, Crosson, Chub, Dickie, Harp, Hamer, Heney, Plastic, Pearceley, Red Chalk East, Red Chalk Main, Westward, Young	981005-981109	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
1999 ice-free benthic temporal study	Keith Somers Ron Reid	Blue Chalk, Clear, Crosson, Chub, Dickie, Fairy, Harp, Hamer, Heney, Plastic, Pearceley, Red Chalk East, Red Chalk Main, Westward, Young	991014-991109	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
2000 - 2006 ice-free benthic temporal study	Keith Somers Ron Reid	Blue Chalk, Clear, Crosson, Chub, Cradle, Dickie, Fairy Harp, Hamer, Heney, Plastic, Pearceley, Red Chalk East, Ridout, Red Chalk Main, Westward, Young	001010-001114	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY	METHODOLOGY PERSONNEL	COMMENTS	
1996 fall benthic surveys Lakes Temporal	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Barb Bruyns, R. Girard Trevor Pawson	
1996 fall benthic surveys lakes Wetlands	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Ron Reid, Sheila David, Barb Bruyns, R. Girard Trevor Pawson	
1997 spring benthic survey	20 sites collected with a D - net (Include a 16A, 17A and 18A)	Rapid bioassessment - 100 organisms only picked and identified to order.	Ron Reid, Sheila David,	K & S set does not have stations 2, 5, 15, or 21 as in the PONAR GRAB set.
1997 fall benthic surveys Lakes Temporal	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
1997 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
1998 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
1999 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
2000 - 2006 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT DESCRIPTION
2001 ice-free benthic temporal study	Keith Somers Ron Reid	Blue Chalk, Clear, Crosson, Chub, Cradle, Delano, Dickie, Fairy, Harp, Hamer, Heney, Plastic, Pincher, Pearceley, Red Chalk East, Red Chalk Main, Ridout Westward, Young	011010-011114	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
2002 ice-free benthic temporal study	Keith Somers Ron Reid	Bigwind, Blue Chalk, Clear, Crosson, Chub, Cradle, Delano, Dickie, Fairy, Harp, Hamer, Heney, Plastic, Pincher, Pearceley, Red Chalk East, Red Chalk Main, Ridout, Westward, Young	0201010-021114	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
2003 ice-free benthic temporal study	Keith Somers Ron Reid	Bigwind, Blue Chalk, Clear, Crosson, Chub, Cradle, Delano, Dickie, Fairy, Harp, Hamer, Heney, Plastic, Pincher, Pearceley, Red Chalk East, Red Chalk Main, Ridout, Westward, Young	031010-031114	temperature, detailed substrate descriptions	benthic invertebrates water chemistry	D - net
2004 ice-free benthic temporal study	Keith Somers Ron Reid	Bigwind, Blue Chalk, Clear, Crosson, Chub, Cradle, Delano, Dickie, Fairy, Harp, Hamer, Heney, Plastic, Pincher, Pearceley, Red Chalk East, Red Chalk Main, Ridout, Westward, Young	041010-041114	temperature, detailed substrate description	benthic invertebrates water chemistry	D - net
2005 - 2006 ice-free benthic temporal study	Keith Somers Ron Reid	Bigwind, Blue Chalk, Clear, Crosson, Chub, Cradle, Delano, Dickie, Fairy, Harp, Hamer, Heney, Plastic, Pincher, Pearceley, Red Chalk East, Red Chalk Main, Ridout, Westward, Young	051010-051114	temperature, detailed substrate description	benthic invertebrates water chemistry	D - net

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2005

PROJECT DESCRIPTION AND YEAR	METHODOLOGY	METHODOLOGY	PERSONNEL	COMMENTS
2001 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
2002 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
2003 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
2004 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	
2005 - 2006 ice-free benthic temporal study	5 sites per lake collected with a D - net	Rapid bioassessment - 100 organisms only picked and identified to order.	Keith Somers Ron Reid	

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1988 crayfish survey Temporal	Greg Mierle Ron Reid	12temporal lakes - Blue Chalk, Clear, Cradle, Crosson, Delano, Hamer, Harp, Plastic, Skidway, Pincher, Westward, Young	880717-880830	water temperature, site descriptions. Crayfish species, sex, carapace length and weight (gram) Were recorded.	water chemistry at mid-lake and 1m tube composite samples at each site; crayfish species	water chemistry - peristaltic pump, or tube composites. Crayfish were collected with modified minnow traps; Entrance enlarged to 5cm. to allow for larger crayfish
1988 crayfish survey Diving Comparison	Greg Mierle Ron Reid	12 temporal lakes - Blue Chalk, Clear, Cradle, Crosson, Delano, Hamer, Harp, Plastic, Skidway, Pincher, Westward, Young	July, August 1988	detailed substrate descriptions; 0-2m, 2-4m, 4-6m.	crayfish; samples Kept?	SCUBA gear
1989 crayfish survey Mercury and CA^{+} Analysis	Greg Mierle Ron Reid	10: Skidway (890510, 890626, 890725, 890822) Blue Chalk (890529, 890607, 890928) Hamer (890613, 890928) Crosson (890619, 890801) Big East (890715, 890926) Gullfeather (890721) Clear (Oakley), Fogal (890928) Red Chalk (890928) Cinder (891002)	May - October	water temperature site descriptions Crayfish species, sex and carapace length were recorded	water chemistry; crayfish were kept frozen until analysis	modified minnow traps
1989 crayfish survey Spatial	Greg Mierle Ron Reid	17 lakes: Red Chalk East, Red Chalk Main, Armishaw, Cinder, Fogal, Oldfield, Code, Healey, Manitouwaba, St. Nora's, Kushog, Boshkung, Big East, Bentshoe, Gullfeather, Clear (Oakley), Saw	890710-890822	Temperature site descriptions	water chemistry,	modified minnow traps
1989 crayfish survey Temporal	Greg Mierle Ron Reid	12 temporal lakes as for 1988 summer collection.	890712-890802	temperature profiles- Blue Chalk, Harp, Delano, Westward	water chemistry mid-lake and 1m comp. At each of 3 sites/ also duplicate mercury samples, Triplicate phosphorus	modified minnow traps

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY (FIELD)	METHODOLOGY (LAB)	PERSONNEL	COMMENTS
1988 crayfish survey Temporal	180 traps were set per lake - 60 traps per site, 10 lines (transects from shore) of traps with 6 traps per line. Traps were set according to water depth i.e., 1-6m. If the water was not Deep enough, extra lines were set to the appropriate depth.	n/a	Ron Reid, Joe Findeis, Shelly Zeran, Sheila David	
1988 crayfish survey Diving Comparison	sites searched by SCUBA divers where traps had been previously set; crayfish caught by hand.	n/a	Prof. Mike Berrill Graeme Taylor	
1989 crayfish survey Mercury and CA^{+} Analysis	Skidway - May 20 traps/3 sites; Blue Chalk May - 10 traps total, Hamer - June 10 traps, Crosson - 10 trpas, Skidway June - 20 traps/ 3 sites, Bait - canned catfood only	crayfish frozen for later analysis. CA^{+} analysis, mercury analysis Christine Headon	Ron Reid, Sheila David Cheryl Partridge, Dave Wright (U of T)	
1989 crayfish survey Spatial	RCE - 20 traps, RCM - 17 traps, Armishaw - 59, Cinder - 53, Fogal - 60, Oldfield - 60, Code - 20, Healey - 54, Manitouwaba - 60, St. Nora's - 60, reset 60, Kushog - 25 traps in 2 sites, Boshkung - 25 traps in 2 sites, Big East - ? , Bentshoe - 60 Gullfeather - ?, Clear (Oakley) - 18 (boat traffic)	n/a Cheryl Partridge	Ron Reid, Sheila David	Code was very small and shallow so only 20 traps were set; 12 raps were reset on Fogal to verify C. robustus species.
1989 crayfish survey Temporal	traps set as for the 1988 temporal study but with only 60 traps per lake.	n/a		

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1990 crayfish survey Temporal	Greg Mierle Ron Reid	14temporal lakes - Blue Chalk, Clear, Cradle, Crosson, Delano, Hamer, Harp, Plastic, Skidway, Pincher, Westward, Young Heney, Pearceley	900703-900809	water temperature, site descriptions. Crayfish species, sex, carapace length and weight (gram) Were recorded.	water chemistry at mid-lake only	water chemistry - peristaltic pump, or tube composites. Crayfish were collected with modified minnow traps; Entrance enlarged to 5cm. to allow for larger crayfish
1990 crayfish survey Diving Comparison	Greg Mierle Ron Reid	Pincher, Twelve Mile	July, August 1990	detailed substrate descriptions; 0-2m, 2-4m, 4-6m.	crayfish; samples Kept?	SCUBA gear
1990 crayfish survey Spatial	Greg Mierle Ron Reid	23 lakes: Lower Welch, Littel Hawk, Kabakwa, Twelve Mile, Kelly, Johnson, Little Kennesis, Little Buckhorn (L'Azure),Goodwin (Loon), Axe, Golden City, Buck, Fawn, Bittern, Haller, Langford, Compass, Round, Fox, Groves, Rose, Lynx	900716-900815	water temperature site descriptions Crayfish species, sex and carapace length were recorded	water chemistry taken at mid-lake only	modified minnow traps
1990 crayfish survey QA/QC	Greg Mierle Ron Reid	1: Crosson	900717-900809	none		
1991 crayfish survey Temporal	Keith Somers Ron Reid	14 temporal lakes as for 1990 temporal study.	910702-910801	temperature profiles	water chemistry mid-lake only	modified minnow traps
1991 crayfish survey Spatial	Keith Somers Ron Reid	25 lakes: Mouse/Ranger, Big Orillia, Little Orillia, Shoe, Echo, Moot, Little Margaret, Margaret, Dickie, Grandveiw, Bigwind, Bird, Nehemiah, Leech, Healey Muskoka, McKay, Frank, Grass, Himbury, Kernick, Clam, Chub, Grindstone.	910717-910829	temperature profiles only	water chemistry mid-lake	modified minnow traps

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY (FIELD)	METHODOLOGY (LAB)	PERSONNEL	COMMENTS
1990 crayfish survey Temporal	Cradle - 18 (6 pre site), Delano - 36, Plastic -36 Pearceley - 60, Pincher - 18, Skidway - 36, Harp - 35, Hamer - 33, Young - 17, Crosson - Clear (Oakley) -18, Blue Chalk - 18, Heney - 54, Westward - 54	n/a	Ron Reid, Sheila David, Ron Ingram, Chris Bird, Samantha Dawley	Traps in for 2 nights at Cradle unable to fly in the next day due to weather.
1990 crayfish survey Diving Comparison	sites searched by 2 SCUBA divers where traps had been previously set; crayfish caught by hand.	n/a	Prof. Mike Berrill, Graeme Taylor	
1990 crayfish survey Spatial	(Lower Welch, Kabakwa, Little Kennesis, Little Buckhorn ,(L'Azure),Goodwin (Loon) Kelly, Johnson, Axe, Golden City Haller, Compass Round, Fox Groves, Lynx) - 54 Buck, Fawn,Red Pine - 52 (Twelve Mile,LipsyLangford Rose,Bittern) - 53	n/a	Ron Reid, Sheila David, Ron Ingram, Chris Bird Samantha Dawley Kim Ralph, Karen Cole	Traps in for 2 nights at Little Hawk unable to fly in the next day due to weather. Crayfish kept from Bittern, Round and Fox for Mercury analysis, and chemistry.
1990 crayfish survey QA/QC		n/a	Ron Reid, Sheila David	
1991 crayfish survey Temporal	54 traps were set on the majority of the lakes	n/a	Ron Reid, Sheila David, Connie O'Brien, Kim Ralph, Brian Borje, D. S., Trevor Pawson, Keith Somers, Ron Ingram, Brian O'Reilly	
1991 crayfish survey Spatial	54 traps were set on the majority of the lakes	n/a	see 1991 Temporal survey	Mouse and Ranger included with Spatial lakes in support of McQueen's work on these lakes

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1992 crayfish survey Temporal	Keith Somers Ron Reid	14biomonitoring lakes - Clear, Cradle, Crosson, Delano, Hamer, Harp, Plastic, Skidway, Pincher, Westward, Young Heney, Pearceley, Blue Chalk	920629-920715	water temperature, site descriptions. Crayfish species, sex, carapace length and weight (gram) Were recorded.	water chemistry at mid-lake only	water chemistry - peristaltic pump, or tube composites. Crayfish were collected with modified minnow traps; Entrance enlarged to 5cm. to allow for larger crayfish
1992 crayfish survey Spatial	Keith Somers Ron Reid	21 lakes: Whalley, Mutton, Richmond, Back, Fairholme, Limestone, Crawford's, Simmons, Grundy, Gut, Rock Island, Harris, Long (Strathdee), Bell, Old Man's, Silver (Bells), Round, Black, Bat, Fowke Cheer.	920713-920813	water temperature, site descriptions. Crayfish species, sex, carapace length and weight (gram) were recorded.	water chemistry at mid-lake only Crayfish were collected with	water chemistry - peristaltic pump, or tube composites. modified minnow traps; Entrance enlarged to 5cm. to allow for larger crayfish
1993 crayfish survey Temporal	Keith Somers Ron Reid	14 biomonitoring lakes	930705-930908	water temperature site descriptions Crayfish species, sex and carapace length were recorded	water chemistry at mid-lake only	modified minnow traps
1993 crayfish survey Spatial	Keith Somers Ron Reid	Mouse, Ranger, Lake Joseph, Muskoka	930707, 930726, 930817	water temperature	water chemistry at mid-lake only crayfish species kept for the Royal Ontario Museum collection Form 1 and Form 2 males and a Female if possible.	modified minnow traps
1994 crayfish survey Temporal	Keith Somers Ron Reid	14 biomonitoring lakes	940627-940721	temperature profiles		modified minnow traps
1994 crayfish survey Spatial	Keith Somers Ron Reid	22 lakes: Mouse/Ranger,Timberwolf, Dickie, Grandveiw, Bigwind,Chub, Scugog, Louisa, Koshlong, Ridout, Basshaunt, Hannah, Middle, Lohi, Clearwater, Red Chalk Main, Red Chalk East, Twelve Mile, Clayton, Fawn, Moot.	940707-940824	temperature profiles only	water chemistry mid-lake crayfish species kept for the Royal Ontario Museum collection Form 1 and Form 2 males and a Female if possible.	modified minnow traps

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY (FIELD)	METHODOLOGY (LAB)	PERSONNEL	COMMENTS
1992 crayfish survey Temporal	54 traps per lake	n/a	Sheila David, Kim Ralph Dave Howell, Brian O"Reilly	
1992 crayfish survey Spatial	54 traps per lake; Zooplankton hauls for Norn Yan	n/a	Sheila David, Kim Ralph Dave Howell, Brian O"Reilly Ron Ingram, Trevor Pawson	
1993 crayfish survey Temporal	54 traps per lake; traps now set attached to lines instead of individual floats i.e., for each site there would be 3 lines of 6 traps. One end of each line is attached to shore (To a tree branch etc.) and the traps are 3 m. apart.	n/a Ron Reid, Sheila David, Joe Findeis, Jon Palmer	Ron Ingram, Kim Ralph Keith Somers, Rick Austin	
1993 crayfish survey Spatial	54 traps per lake; set as for 1993 hereafter	n/a	Ron Reid, Keith Somers Ron Ingram, Bev Clark Rick Austin	
1994 crayfish survey Temporal	54 traps per lake	n/a	Sheila David, Ron Ingram R. Girard, Dan Dahms	
1994 crayfish survey Spatial	54 traps per lake	n/a	Sheila David, Ron Ingram R. Girard, Dan Dahms Ron Reid, Keith Somers Joe Findeis	

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED (I.E., PER YR / PER SERIES)	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1994 crayfish survey QA/QC	Keith Somers Ron Reid	Heney, Crosson	940808-940815	water temperature Crayfish species, sex, carapace length and weight (gram) were recorded.		Crayfish were collected with modified minnow traps; Entrance enlarged to 5cm. to allow for larger crayfish
1995 crayfish survey Temporal	Keith Somers Ron Reid	10 lakes: Blue Chalk, Clear Crosson, Hamer, Harp, Heney, Pearceley, Plastic, Westward, Young, (Cradle, Delano, Pincher, Skidway no longer sampled due to cost; i.e., Fly-in lakes.	950626-950711	water temperature Crayfish species, sex, carapace length and weight (gram) were recorded.		Crayfish were collected with modified minnow traps; Entrance enlarged to 5cm. to allow for larger crayfish
1995 crayfish survey QA/QC	Keith Somers Ron Reid	Westward; Blue Chalk (2 nights)	950622-950816 950823-950825	water temperature Crayfish species, sex and carapace length were recorded		modified minnow traps
1995 crayfish survey Spatial	Keith Somers Ron Reid	Buck, Halls, Crown, Bear, Brandy Leonard, Buckhorn, Chemong, Glen, Boshkung, Aylen, Doughnut, Sherborne, Meach, Dickey, Smoke, Kawagama, Balsam	950628-950822	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry; crayfish species kept for the Royal Ontario Museum collection; Form 1 and Form 2 males and a Female if possible.	modified minnow traps
1996 crayfish survey Temporal	Keith Somers Ron Reid	9 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic	960723-960813 Crayfish species, sex	water temperature and carapace length were recorded	mid-lake chemistry done by R. Girard according to the 1996 Lake sampling schedule	modified minnow traps
1997 crayfish survey Temporal	Keith Somers Ron Reid	14 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic, Clear Hamer, Pearceley, Westward, Young	970718-970825	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or R. Girard according to the 1997 Lake sampling schedule	modified minnow traps

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS -BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	NUMBER OF LAKES/STREAMS SAMPLED	SAMPLING PERIOD	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT
1998 crayfish survey Temporal	Keith Somers Ron Reid	14 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic, Clear Hamer, Pearceley, Westward, Young	980713-980812	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or R. Girard according to the 1998 Lake sampling schedule	modified minnow traps
1999 crayfish survey Temporal	Keith Somers Ron Reid	16 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic, Clear Hamer, Pearceley, Westward, Young Bigwind, Ridout	990706-990813	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or B. Clark according to the 1999 Lake sampling schedule	modified minnow traps
2000 crayfish survey Temporal	Keith Somers Ron Reid	17 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic, Clear Hamer, Pearceley, Westward, Young, Cradle, Delano, Pincher	000701-000831	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or B. Clark according to the 2000 Lake sampling schedule	modified minnow traps
2001 crayfish survey Temporal	Keith Somers Ron Reid	19 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic, Clear Hamer, Pearceley, Westward, Young, Cradle, Delano, Pincher, Bigwind, Ridout	010701-010831	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or B. Clark according to the 2001 Lake sampling schedule	modified minnow traps
2002 crayfish survey Temporal	Keith Somers Ron Reid	19 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic, Clear Hamer, Pearceley, Westward, Young, Cradle, Delano, Pincher, Bigwind, Ridout	020701-020831	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or R. Ingram according to the 2002 Lake sampling schedule	modified minnow traps
2003 crayfish survey Temporal	Keith Somers Ron Reid	19 lakes; Blue Chalk, Red Chalk East, Red Chalk Main, Chub, Crosson, Dickie, Harp, Heney, Plastic, Clear Hamer, Pearceley, Westward, Young, Cradle, Delano, Pincher, Bigwind, Ridout	030701-030831	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or R. Ingram according to the 2003 Lake sampling schedule	modified minnow traps
2004 crayfish survey 2005 - 2006 crayfish survey	Keith Somers Ron Reid	same lakes as 2001 to 2003	same date ranges as 2001-2003	water temperature Crayfish species, sex and carapace length were recorded	mid-lake chemistry done by crayfish crew or Michelle Palmer & Ron Ingram Lake sampling schedule	modified minnow traps

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	METHODOLOGY (FIELD)		METHODOLOGY (LAB)	PERSONNEL	COMMENTS
1994 crayfish survey QA/QC	54 traps per lake - compare catches		n/a	Sheila David, Ron Ingram	
1995 crayfish survey Temporal	54 traps per lake		n/a	Sheila David, Ron Ingram	Pearceley site #2 changed to landing side of point where 2nd cottage is
1995 crayfish survey QA/QC	54 traps per lake		n/a	Ron Reid, Sheila David, Ron Ingram, Keith Somers	
1995 crayfish survey Spatial	54 traps per lake		n/a	Sheila David, Ron Ingram Kim Ralph, Joe Findeis	
1996 crayfish survey Temporal	54 traps per lake		n/a	Sheila David, Ron Reid Bev Clark	temporal (biomonitoring) lakes reduced to 9 lakes; 5 lakes previously part of the series; 4 lakes new; Red Chalk Main, Chub, Red Chalk East, Dickie. No spatial lake survey.
1997 crayfish survey Temporal	54 traps per lake		n/a	Keith Somers, Ron Reid	1996 lakes plus 5 more lakes Clear, Hamer, Pearceley, Westward, Young
1998 crayfish survey Temporal	54 traps per lake		n/a	Keith Somers, Ron Reid	Same 14 lakes as in 1997
1999 crayfish survey Temporal	54 traps per lake	additional Spatial = Big East L.	n/a	Keith Somers, Ron Reid	Same 14 lakes as in 1998 Plus Bigwind
2000 crayfish survey Temporal	54 traps per lake	additional Spatial = Skidway L.	n/a	Keith Somers, Ron Reid	14 lakes as in 1999 minus Bigwind, added Cradle, Delano, & Pincher
2001 crayfish survey Temporal	54 traps per lake	additional Spatial = Big Hawk, Clayton, Margaret L.	n/a	Keith Somers, Ron Reid	Same 17 lakes as in 2000 Plus Bigwind
2002 crayfish survey Temporal	54 traps per lake	additional Spatial = Grindstone, Kabakwa, Koshlong, Kushog, Ranger	n/a	Keith Somers, Ron Reid	Same 18 lakes as in 2001
2003 - 2006 crayfish survey Temporal	54 traps per lake		n/a	Keith Somers, Ron Reid	Same 18 lakes as in 2002

SUMMARY OF THE BIOLOGY PROGRAMS USING BENTHOS - BIOMONITORING SECTION FROM 1987 - 2006

PROJECT DESCRIPTION AND YEAR	PROJECT LEADER	FIELD MEASUREMENTS COLLECTED	TYPE OF SAMPLE COLLECTED	TYPE OF EQUIPMENT	PERSONNEL	COMMENTS
1990 Algonquin Park Blackfly emergence study	Ron Hall	water chemistry, water discharge, max., min., ambient temperatures	blackfly larva, stream water	pygmy current meter TN0371, blackfly emergence traps	Ron Hall, Sheila David, Samantha Dawley, Allan Zudema, Joe Findeis, John Forsyther, Karen Cole	
1991 Algonquin Park Blackfly emergence study	Ron Hall	water chemistry, water discharge	blackfly larva stream water	pygmy current meter TN0371, blackfly emergence traps	Joe Findeis, Ron Ingram, Kim Ralph, Brian O'Reilly, Connie O'Brian	91/08/01 replaced 1 trap, moved trap 10 (Joe Findeis)
1992 Algonquin Park Blackfly emergence study	Ron Hall	water chemistry, water discharge	blackfly larva stream water	pygmy current meter TN0371, blackfly emergence traps	Ron Ingram, Kim Ralph, Sheila David, Joe Findeis, Bev Clark, R. Girard	
1993 Algonquin Park Blackfly emergence study	Ron Hall	water chemistry, water discharge	blackfly larva stream water	pygmy current meter TN0371, blackfly emergence traps	Ron Ingram, Joe Findeis, Jon Palmer	
1994 Algonquin Park Blackfly emergence study	Ron Hall	water chemistry, water discharge	blackfly larva stream water	pygmy current meter TN0371, blackfly emergence traps	Ron Ingram, Joe Findeis	

Appendix 6

List of OMNR Fish ID Codes and Names of Fish Species

Ontario Ministry of Natural Resources. 1987.
Manual of Instructions: Aquatic Habitat Inventory Surveys, Appendix 2

Appendix 6. Fish ID Codes and names of fish species

Code	Code	Name	Scientific Name
Code		**Petromyzontidae**	**Lamprey family**
	11	American brook lamprey	*Lampetra appendix*
	12	northern brook lamprey	*Ichthyomyzon fossor*
	13	silver lamprey	*Ichthyomyzon unicuspis*
	14	sea lamprey	*Petromyzon marinus*
	15	*Ichthyomyzon sp.*	
20		**Polyodontidae**	**Paddlefish family**
	21	paddlefish	*Polyodon spathula*
30		**Acipenseridae**	**Sturgeon family**
	31	lake sturgeon	*Acipenser fulvescens*
	32	caviar (commercial use)	
40		**Lepisosteidae**	**Gar family**
	41	longnose gar	*Lepisisteus osseus*
	42	spotted gar	*Lepisisteus oculatus*
	43	*Lepisosteus sp.*	
50		**Amiidae**	**Bowfin family**
	51	bowfin	*Amia calva*
60		**Clupeidae**	**Herring family**
	61	alewife	*Alosa pseudoharengus*
	62	American shad	*Alosa sapidissima*
	63	gizzard shad	*Dorosoma cepedianum*
	64	*Alosa sp.*	
70		**Salmoninae**	**Salmon and trout subfdamily**
	71	pink salmon	*Oncorhynchus gorbuscha*
	72	chum salmon	*Oncorhynchus keta*
	73	coho salmon	*Oncorhynchus kisutch*
	74	sockeye salmon	*Oncorhynchus nerka*
	75	chinook salmon	*Oncorhynchus tshawytscha*
	76	rainbow trout	*Salmo gairdneri*
	77	Atlantic salmon	*Salmo salar*
	78	brown trout	*Salmo trutta*
	79	Arctic char	*Salvelinus alpinus*
	80	brook trout	*Salvelinus fontinalis*
	81	lake trout	*Salvelinus namaycush*
	82	splake	*Salvelinus fontinalis* x *Salvelinus namaycush*
	83	Aurora trout	*Salvelinus fontinalis timagamiensis*
	84	*Oncorhynchus sp.*	
	85	*Salmo sp.*	
	86	*Salvelinus sp.*	
90		**Coregoninae**	**Whitefish subfamily**
	91	lake whitefish	*Coregonus clupeaformis*
	92	longjaw cisco	*Coregonus alpenae*
	93	cisco (lake herring)	*Coregonus artedii*
	94	bloater	*Coregonus hoyi*
	95	deepwater cisco (chub)	*Coregonus johannae*
	96	kiyi	*Coregonus kiyi*
	97	blackfin cisco	*Coregonus nigripinnis*

Appendix 6 cont'd. Fish ID Codes and names of fish species

	Code	Name	Scientific Name
	**098.88	Nipigon cisco	*Coregonus nipigon*
	99	shortnose cisco	*Coregonus reighardi*
	100	shortjaw cisco	*Coregonus zenithicus*
	101	pygmy whitefish	*Prosopium coulteri*
	102	round whitefish	*Prosopium cylindraceum*
	103	chub	*Coregonus* spp. (Cisco species other than *C. artedii*)
	106	*Coregonus* sp.	
	107	*Prosopium* sp.	
110		**Thymallinae**	**Grayling subfamily**
	111	Arctic grayling	*Thymallus arcticus*
120		**Osmeridae**	**Smelt family**
	121	rainbow smelt	*Osmerus mordax*
130		**Esocidae**	**Pike family**
	131	northern pike	*Esox lucius*
	132	muskellunge	*Esox masquinongy*
	133	grass pickerel	*Esox americanus vermiculatus*
	134	*Esox* sp.	
	135	chain pickerel	*Esox niger*
	***098.*	*Scott and Crossman (1973)*	*synonymized this species with C. artedii*
140		**Umbridae**	**Mudminnow family**
	141	central mudminnow	*Umbra limi*
150		**Hiodontidae**	**Mooneye family**
	151	goldeye	*Hiodon alosoides*
	152	mooneye	*Hiodon tergisus*
160		**Catostomidae**	**Sucker family**
	161	quillback	*Carpiodes cyprinus*
	162	longnose sucker	*Catostomus catostomus*
	163	white sucker	*Catostomus commersoni*
	164	lake chubsucker	*Erimyzon sucetta*
	165	northern hog sucker	*Hypentelium nigricans*
	166	bigmouth buffalo	*Ictiobus cyprinellus*
	167	spotted sucker	*Minytrema melanops*
	168	silver redhorse	*Moxostoma anisurum*
	169	black redhorse	*Moxostoma duquesnei*
	170	golden redhorse	*Moxostoma erythrurum*
	171	shorthead redhorse	*Moxostoma macrolepidotum*
	172	greater redhorse	*Moxostoma valenciennesi*
	173	river redhorse	*Moxostoma carinatum*
	174	black buffalo	*Ictiobus niger*
	176	*Catostomus* sp	
	177	*Moxostoma* sp.	
	178	*Ictiobus* sp.	

Appendix 6 cont'd. Fish ID Codes and names of fish species

	Code	Name	Scientific Name
180		**Cyprinidae**	**Minnow family**
	181	goldfish	*Carassius auratus*
	182	northern redbelly dace	*Phoxinus eos*
	183	finescale dace	*Phoxinus neogaeus*
	184	redside dace	*Clinostomus elongaeus*
	185	lake chub	*Couesius plumbeus*
	186	common carp	*Cyprinus carpio*
	187	gravel chub	*Hybopsis x-punctata*
	188	cutlip minnow	*Exoglossum maxillingua*
	189	brassy minnow	*Hybognathus hankinsoni*
	190	eastern silvery minnow	*Hybognathus regius*
	191	silver chub	*Hybopsis storeriana*
	192	horneyhead chub	*Nocomis biguttatus*
	Code	**Name**	**Scientific Name**
	193	river chub	*Nocomis micropogon*
	194	golden shine	*Notemigonus crysoleucas*
	195	pugnose shiner	*Notropis anogenus*
	196	emerald shiner	*Notropis atherinoides*
	197	bridle shiner	*Notropis bifrenatus*
	198	common shiner	*Notropis cornutus*
	199	blackchin shiner	*Notropis heterodon*
	200	blacknose shiner	*Notropis heterolepis*
	201	spottail shiner	*Notropis hudsonius*
	202	rosyface shiner	*Notropis rubellus*
	203	spotfin shiner	*Notropis spilopterus*
	204	sand shiner	*Notropis stramineus*
	205	redfin shiner	*Notropis umbratilis*
	206	mimic shiner	*Notropis volcellus*
	207	pugnose minnow	*Notropis emiliae*
	208	bluntnose minnow	*Pimephales notalus*
	209	fathead minnow	*Pimephales promelas*
	210	blacknose dace	*Rhinichthys atratulus*
	211	longnose dace	*Rhinichthys cataractae*
	212	creek chub	*Semotilus atromaculatus*
	213	fallfish	*Semotilus corporalis*
	214	pearl dace	*Semotilus margarita*
	215	silver shiner	*Notropis photogenis*
	216	central stoneroller	*Campostoma anomalum*
	217	striped shiner	*Notropis chrysocephalus*
	218	ghost shiner	*Notropis buchanani*
	221	*Phoxinus* sp.	
	222	*Hybognathus* sp.	
	223	*Nocomis* sp.	
	224	*Notropis* sp.	
	225	*Pimephales* sp.	
	226	*Rhinichthys* sp.	
	227	*Semotilus* sp.	
	228	*Hybopsis* sp.	

Appendix 6 cont'd. Fish ID Codes and names of fish species

	Code	Name	Scientific Name
230		**Ictaluridae**	**Catfish family**
	231	black bullhead	*Ictalurus melas*
	232	yellow bullhead	*Ictalurus natalis*
	233	brown bullhead	*Ictalurus nebulosus*
	234	channel catfish	*Ictalurus punctatus*
	235	stonecat	*Noturus flavus*
	236	tadpole madtom	*Noturus gyrinus*
	237	brindled madtom	*Noturus miurus*
	238	margined madtom	*Noturus insignis*
	239	flathead catfish	*Pylodictis olivaris*
	241	*Ictalurus sp.*	
	242	*Noturus sp.*	
	243	*Ictalurus sp.*	(other than I. punctatus)
	244	northern madtom	*Noturus stigmosus*
250		**Anguillidae**	**Freshwater Eel family**
	251	American eel	*Anguilla rostrata*
260		**Cyprinodontidae**	**Killifish family**
	261	banded killifish	*Fundulus diaphanus*
	262	black striped	*Fundulus notatus*
270		**Gadidae**	**Cod family**
	271	burbot	*Lota lota*
	Code	**Name**	**Scientific Name**
280		**Gasterosteidae**	**Stickleback family**
	281	brook stickleback	*Culaea inconstans*
	282	threespine stickleback	*Gasterosteus aculeatus*
	283	ninespine stickleback	*Pungitius pungitius*
	284	fourspine stickleback	*Apeltes quadracus*
290		Percopsidae	Trout-perch family
	291	trout perch	Percopsis omiscomaycus
300		Percichthyidae	Temperate Bass family
	301	white perch	Morone americana
	302	white bass	Morone chrysops
	303	Morone sp.	

Appendix 6 cont'd. Fish ID Codes and names of fish species

Code	Name	Scientific Name
310	**Centrarchidae**	**Sunfish family**
311	rock bass	*Amblopites rupestris*
312	green sunfish	*Lepomis cyanellus*
313	pumpkinseed	*Lepomis gobbosus*
314	blugill	*Lepomis macrochirus*
315	longear sunfish	*Lepomis megalotis*
316	smallmouth bass	*Micropterus dolomeiui*
317	largemouth bass	*Micropterus salmoides*
318	white crappie	*Pomoxis annularis*
319	black crappie	*Pomoxis nigromaculatus*
320	*Lepomis* sp.	
321	*Micropterus* sp.	
322	*Pomoxis* sp.	
323	Warmouth	
324	orangespotted sunfish	
330	**Percidae**	**Perch family**
331	yellow perch	*Perca flavescens*
332	sauger	*Stizostedion canadense* ***(revised to Sander canadensis)***
333	blue pike	*Stizostedion vitreum glaucum* ***(Sander vitreus glaucus – extinct)***
334	walleye	*Stizostedion vitreum vitreum* ***(Sander vitreus vitreus)***
335	eastern sand darter	*Ammocrypta pellucida*
336	greenside darter	*Etheostoma blennioides*
337	rainbow darter	*Etheostoma caeruleum*
338	Iowa darter	*Etheostoma exile*
339	fantail darter	*Etheostoma flabellare*
340	least darter	*Etheostoma microperca*
341	johnny darter	*Etheostoma nigrum*
342	logperch	*Percina caprodes*
343	channel darter	*Percina copelandi*
344	blackside darter	*Percina maculata*
345	river darter	*Percina shumardi*
346	tessellated darter	*Etheostoma olmstedi*
347	*Stizostedion* sp.*(Sander* sp.*)*	
348	*Etheostoma* sp.	
349	*Percina* sp.	
360	**Atherinidae**	**Silverside family**
361	brook silverside	*Labidesthes sicculus*
370	**Sciaenidae**	**Drum family**
371	freshwater drum	*Aplodinotus grunniens*

Appendix 6 cont'd. Fish ID Codes and names of fish species

Code	Name	Scientific Name
380	**Cottidae**	**Sculpin family**
381	mottled sculpin	*Cottus bairdi*
382	slimy sculpin	*Cottus cognatus*
383	spoonhead sculpin	*Cottus ricei*
384	deepwater sculpin	*Myoxocephalus thompsoni*
385	*Cottus* sp.	
386	*Myoxocephalus* sp.	
387	fourhorn sculpin	*Myoxocephalus quadricornis*
390	**Cyclopteridae**	**Lumpfish and snailfish family**
391	lumpfish	*Cyclopterus lumpus*
400	**Salmoniddae**	**Hybrids**
500	**Esocidae**	**Hybrids**
501		*Esox lucius x Esox americanus vermiculatus*
502		*Esox lucius x Esox masquinongy*
600	**Cyprinidae**	**Hybrids**
601		*Carassius auratus x Cyprinus carpio*
602		*Phoxinus hybrid*
603		*Phoxinus eos x Phoxinus neogaeus*
604		*Phoxinus eos x Semotilus margarita*
605		*Phoxinus neogaeus x Semotilus margarita*
610		*Notropis hybrids*
611		*Notropis cornutus x Notropis rubellus*
612		*Notropis cornutus x Semotilus atromaculatus*
620		*Pimephales promelas x Pimephales notatus*
650	**Ictaluridae**	**Hybrids**
651		*Ictalurus melas x Ictalurus nebulosus*
700	**Centrarchidae**	**Hybrids**
701		*Lepomis hybrids*
702		*Lepomis gibbosus x Lepomis macrochirus*
703		*Lepomis cyanellus x Lepomis gibbosus*
704		*Lepomis cyanellus x Lepomis megalotis*
705		*Lepomis cyanellus x Lepomis macrochirus*
706		*Pomoxis annularis x Pomoxis nigromaculatus*
750	**Percidae**	**Hybrids**
751		*Stizostedion canadense x Stizostedion vitreum* Revised to *Sander canadensis x Sander vitreus*
800	**Cottidae**	**Hybrids**
801		*Cottus bairdi x Cottus cognatus*
900	**For Commercial Fish**	
998	Roe	
999	mixed scrap (animal	

Appendix 7

Conversion Factors for Physical, Chemical and Calender Parameters

Physical conversion factors: metric conversion and notation

Bold text indicates the most commonly used conversion factors

Linear 1 centimetre (cm) = 10 millimeter (mm) micron (μm) = 0.000001 metres (m)

1 metre (m) = 100 (cm) and mm (ie. Precipitation depth) X 0.001 = m precipitation

1 kilometre (km) = 1000 (m)

Conversions 1 inch = 2.54 cm 1 cm = 0.3937 inches **feet (ft) X 0.3048 = metres (m)**

1 foot = 30.38 cm 1 m = 3.281 feet metres (m) X 3.281 = feet (ft)

1 mile = 1.609 km 1 km = 0.621 miles **yards (yd) X 0.914 = metres (m)**

metres (m) X 1.094 = yards (yd)

Area 1 cm^2 = 100 mm^2

1 m^2 = 10,000 cm^2 and m^2 X 1000 = litres (ie. Precipitation deposition)

1 hectare (ha) = 10,000 m^2 = 0.01 km^2

1 km^2 = 100 ha = 1,000,000 m^2

Conversions 1 sq. inch = 6.4515 cm^2 1 cm^2 = 0.1550 sq. inches 1 m^2 = 10.76 sq. feet

1 sq. mile = 2.589 km^2 1 km^2 = 0.3862 sq. miles 1 m^2 = 1.196 sq. yards

= 258.9 ha = 247.1996 acres

1 acre = 0.00405 km^2 1 ha = 2.471 acres

= 0.4047 ha or 4047 m^2 = 0.0039 aq. miles

acres (ac) X 0.4047 = hectares (ha)

sq. yards X 0.836 = sq. metres or sq. metres X 1.196 = sq. yards

Fluids 1000 millilitres (ml) = 1 Litre (L) 16 ounces (oz). = 1 quart (qt) 4 quarts = 1gallon (gal)

10 British Litres = 2.643 U.S. gallons,

Conversions 28.4 ml = 1 fl.oz. 1 British Litre = 0.2643 U.S. gallons

1.14 L = 1 qt 1 U.S. gallon = 1.0/0.2643 = 3.7836 British litres

4.55 L = 1 gal. or 1 L = 0.22 gal and 3.7836 litres = 3.7836 / 4.55 = 0.8316 British gallons

Therefore 0.8316 British gallon = 1 U.S. gallon

Physical conversion factors cont'd:

Bold text indicates the most commonly used conversion factors

Volume Conversions

1 m^3 = 0.000,813 acre feet **1 acre foot = 0.123 x10^4 m^3**

1 m^3 X 1.308 = cubic yard or yd^3 X 0.765 = m^3

1 **m^3 X 35.31 = cubic feet** or ft^3 X 0.028 = m^3

Flow 1 cubic foot/sec. (c.f.s.) = 0.028 m^3 s^{-1} 1 m^3 s^{-1} = 35.714 c.f.s

Hydrologic flow L • sec^{-1} X 86,400 = L • day^{-1} (60 sec X 60 min X 24 hr = 86,400)

1 m^3 s^{-1} = 1000 litres s^{-1} and μg • L^{-1} = mg • m^{-3} as concentration per volume

Where (ie. Precipitation deposition) Litres X μg • L^{-1} (chemical concentration) / 1,000,000,000 = kg load per unit time (ie., duration of precipitation collection interval between chemical sample collection dates)

kg • yr^{-1} / 1000 = metric tons load per year

parts per million (ppm) = (mg/L) milligrams per litre

Weight

1 metric ton (MT or t) = 1,000,000 gm or 1000 kg

1 kg = 1000 gm

1 mg = 0.001 g

1 μg = 0.0001g

Conversions

1 kg = 2.2046 lb (pound) **or lb X 0.454 = kg**

1000 kg = 1.1 tons or (1 kg X 2.2046) = 2,204.6 lb

1 gm = 0.0353 oz (ounce) **or oz X 28.349 = gm**

1 MT X 1.102 tons U.S. or 2,204.6 lb

(mg) = milligrams

(μg) = micrograms to (μEq) microequivalence **(see Chemical conversion factors)**

& (μm) micron mesh size

Temperature

degrees Celsius X 9/5 (then add 32) or degrees Fahrenheit X 5/9 (after subtracting 32)

where 9/5 = 1.8 & 5/9 = 0.5556

Physical conversion factors cont'd:

Bold text indicates the most commonly used conversion factors

Velocity Unit and Conversion Factors for Wind Data

Units	**m/s**	**km/h**	**mph**	**knots**	**ft/sec**
m/s	1.0	3.6	2.237	1.942	3.281
km/h	0.278	1.0	0.621	0.540	0.911
mph	0.447	1.609	1.0	0.868	1.467
knots	0.515	1.853	1.152	1.0	1.689
ft/sec	0.305	1.097	0.682	0.592	1.0

Unit and Conversion for Atmospheric Pressure

1 millibar = 0.02952998 inch of mercury and 1 millibar = 0.7500616 millimeter of mercury

Chemical conversion factors : data conversion

Parameter	Mass Units (Water)	Microequivalence Conversion Factor
ALKT 'S	mg L^{-1}	x 19.98
ALUT	μg L^{-1}	/ 26.98
NNHTFR	μg L^{-1}	/ 14.01
CAUR	mg L^{-1}	x 1000 / 20.04
CLIDUR	mg L^{-1}	x 1000 / 35.46
DOC	mg L^{-1}	x 1000 / 12.01
pH (H+)	μg L^{-1}	μeq L^{-1} = mg L^{-1}
FFIDUR	μg L^{-1}	/ 19.00
FEUT	mg L^{-1}	x 1000 / 55.85
MGUR	mg L^{-1}	x 1000 / 12.155
MNUT	mg L^{-1}	x 1000 / 54.94
NNOTFR	μg L^{-1}	/ 14.01
KKUR	mg L^{-1}	x 1000 / 39.1
TP	μg L^{-1}	/ 30.98
SIO3UR	mg L^{-1}	x 1000 / 28.09
NAUR	mg L^{-1}	x 1000 / 22.99
SSO4UR	mg L^{-1}	x 1000 / 48.035
NNTKUR	μg L^{-1}	/ 14.01

Monovalent to Divalent ratio in μeq L^{-1} is calculated as: (Na + K) / (Ca + Mg)

The sum of the anions and cations are directly available from the Chemistry database

Cumulative Nitrogen (μg L^{-1}) **and total inorganic nitrogen to total nitrogen ratio** is calculated in the following manner:

Organic nitrogen = (TKN – NH_4 –N)

where total organic nitrogen = NNTKUR minus NNHTFR

Inorganic nitrogen = ($NO_{2,3}$ –N + NNH_4 –N)

where total inorganic nitrogen = NNOTFR plus NNHTFR

Total nitrogen = (TKN + $NO_{2,3}$)

where total nitrogen = NNTKUR plus NNOTFR

The total inorganic nitrrogen to total nitrogen ration calculation is:

= (($NO_{2,3}$ –N + NNH_4 –N) / (TKN + $NO_{2,3}$)

Where the ratio = (NNOTFR plus NNHTFR) divided by (NNTKUR plus NNOTFR)

Calendar Conversion Factors : Julian Day Calendar

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	**JAN**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2	**FEB**	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		
3	**MAR**	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
4	**APR**	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
5	**MAY**	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151
6	**JUN**	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	
7	**JUL**	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212
8	**AUG**	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243
9	**SEP**	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	
10	**OCT**	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304
11	**NOV**	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	
12	**DEC**	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	364	364	365

Add 1 to grey values during Leap Years.
Study period leap years occurred in 1972, 1976, 1980, 1984, 1988, 1992, 1996, 2000, 2004, 2008
Leap Year: every year whose number is exactly divisible by 4, except centenary years, which must be exactly divisible by 400